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April

MODERN MECHANIX

& INVENTIONS MAGAZINE

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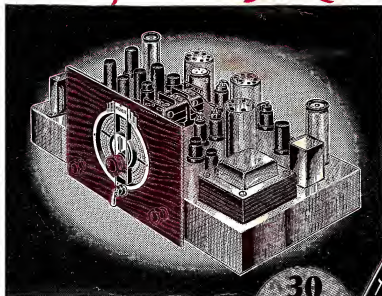


**ELECTRIC EYE AUTOMOBILE
SEE PAGE 71**

\$1,000 CASH PRIZES FOR YOU SEE Entry Contest Rules Page 42 \$1,000

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30
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PAYMENT
TERMS



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(Patent No. 36750) The V-Front Dispensing Vanes established a new radio style overnight. They spread the beautiful face-work of "highs" throughout the room in a scientific manner... directing the High Fidelity waves uniformly to the ear. Now, set complete range of audible frequencies... achieving glorious new acousti-tone... assuring life-like crystal-clear "concert" realism. No middleman's profits to pay. You buy at wholesale prices, direct from Laboratories... saving 30% to 50%. You can order your 1936 Midwest radio from the new 40-page catalog with as much certainty of selection as if you were to come yourself to our great laboratories. You save 30% to 50%... you get 30 days' FREE trial... as little as \$5.00 down plus a \$1.00-a-week charge for your home. Your are fully protected with a One-Year Guarantee, Foreign Reception Guarantee, Money-back Guarantee.



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National Radio Institute

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IN RADIO**

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"One week my business netted \$75.00 in repairing alone, and there were sales to be added. I have only you to thank for it. In my opinion, N.R.I. is the best home-study school in the United States."—R. S. LEWIS, Box 514, Pittsfield, Ill.

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Many Radio Experts Make \$30, \$50, \$75 a Week

Consider these facts—think of the good jobs they stand for. Over 20,000,000 Radio sets in use, over 600 broadcasting stations, over 40 manufacturers of Radio sets, over 2,000 manufacturers of parts, over 100 Police Departments Radio equipped, airplanes and airports Radio equipped. Thousands of ships touching every seaport of the world, are Radio equipped. Over 35,000 stores selling sets and parts, over 200,000 auto Radio equipped. Loud speaker systems wherever people gather, indoors and outdoors. Commercial Radio stations dotting our coast lines. Radio a big industry—is growing bigger. A few hundred \$30, \$50, \$75 a week jobs have grown to thousands in recent years.

Get Ready Now for Jobs Like These

A spare time or full time service shop; installing, maintaining, operating—broadcasts, aviation, commercial, ship, television and speaker stations. A Radio retail or service business of your own. Installing, maintaining, servicing, loud speaker systems. A service or sales job with a store or jobber. I'll train you for good jobs in many branches of Radio.

Many Make \$5, \$10, \$15 a Week Extra In Spare Time Almost at Once

The day you enroll I start sending you Extra Money Job Sheets which quickly show you how to do Radio repair jobs common in almost every neighborhood. Get my book—see for yourself that many of my students make \$200 to \$1,000 in their spare time while learning.

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J. E. SMITH, President
National Radio Institute, Dept. 6DH
Washington, D. C.

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hundreds of
men make
more money



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National Radio Institute, Dept. 6DH
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MODERN MECHANIX

& INVENTIONS MAGAZINE

APRIL,
1936

Volume XV
Number 6

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Business Demands Accountancy

—because Accountants Command Business

ACCOUNTANTS have been in demand—at far better than average earnings.

But today—more than ever before—the competent accountant finds his services at a tremendous and increasing premium.

In the depression business tightened up the reins and is watching costs—prices—every move—striving to operate on that basis of close control so essential to profits.

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The Home Study Way to Accountancy Success

Thousands upon thousands of men have trained for Accountancy with LaSalle—at night—at home.

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Whether their goal was a C. P. A. degree or advancement in business, our files are full to overflowing with letters reporting income increases so far out of line with the time and cost investment that there is no comparison.

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F. F. A. was a railroad yard clerk at \$112 a month when he began accountancy training with LaSalle. Five years later, his income was 500% larger and he was a Certified Public Accountant and attorney. F. C. was 22 years of age and general all-around man in an Arkansas lumber yard at \$75 a month. Five months later, his firm made him manager at \$125, and ten months later promoted him to a larger yard at \$250 plus a commission on sales.

O. D. always thought stories about LaSalle training were fairy tales until the training helped him—a clerk at \$75 a month—move up in six months to \$125, and within four years to \$250. Today he is General Auditor of a large national organization—and his income is more than seven times his starting salary.

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 2. Have you determination?
 3. Can you see and grasp an opportunity?
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Name.....

Present Position.....

Address.....



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*After 8000 miles of driving
renew your*

PUROLATOR

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Many Little Ideas Have Big Commercial Possibilities

For example, who knows the name of the inventor of the wooden golf tee, the ordinary crinkly hair pin, or the metal ball or disc that the average housewife uses for scouring pots and pans? Who knows the inventors of the thousands of gadgets that you will find in the ten-cent stores, in the modern drug and department stores? Some day, stop and look at some of the simple articles you'll find on the counters of a ten-cent store. Notice how many of them are marked Patented or Patent Applied For. It is an interesting, educational experiment. These inventors, most of them, weren't of the genius class. They simply got an idea for doing something in a better, easier, faster, or more economical way—AND THEN DID SOMETHING ABOUT IT.

Interesting Points

Who is today's "champion inventor"?

Ans.: John P. O'Connor, of Chicago, Ill., holds 949 Patents, more than any other living man.

Who is "Lady Edison"?

Ans.: Miss Ruyiah Louise Henry of New York City leads all women inventors; holds fifty patents; is known as "Lady Edison".

What is an improvement?

Ans.: Nearly all inventions today are improvements over earlier inventions. Often the improvement proves more profitable than the earlier invention.

Is a model necessary?

Ans.: Today, most inventions are patented without models. A subject fully explained in our book.

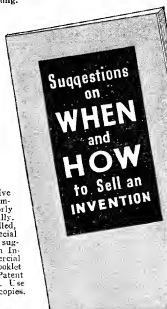
What is the preliminary search?

Ans.: The preliminary search is ordinarily the first step to help an inventor. Also fully explained in our book. Send for a copy today.

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a good idea

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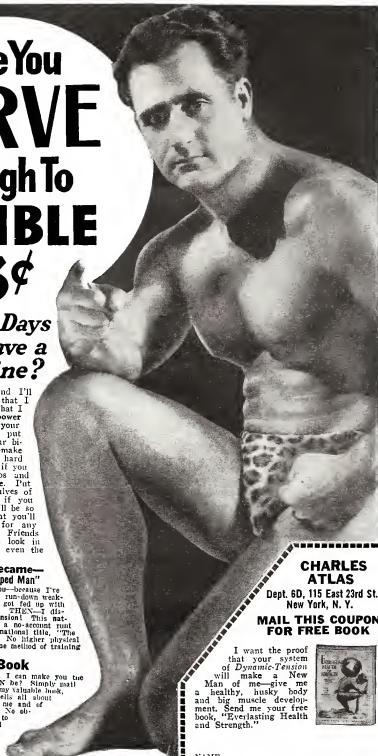
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Problems

Your Questions Answered By M M's Editors

WIND CHARGER FAILS TO OPERATE

I constructed the wind power generator described in the 1935 "HOW TO BUILD IT" and while it operates easily in mild winds it brakes itself when the propeller reaches a charging speed. It appears that the current produces a strong magnetic field that holds back the armature so that the propeller will revolve only when the breeze is slight. Can you help me as I should like to get this thing operating.—R. E. St. J., San Antonio, Tex.

It seems evident that you have a short in your generator somewhere since it slows down just at the point where the cutout contacts close. It is possible, too, that you are overloading your generator.

ELECTRO-MAGNET COILS OVERHEAT

I have wound several magnets for use on a six-volt battery. They all heat up to such an extent that the insulation burns off. Can you tell me how I can prevent this and, also, how I can be sure that each magnet has a uniform amount of lifting power.—B. L., Modesta, Calif.

The wire which you used was too heavy and was drawing far too much current. The heating which you experienced can be eliminated by using a finer wire, 200-turns of No. 20 or No. 22 should work nicely.

To make electro-magnets of equal strength use the same number of turns of the same size wire. Be sure to wind them in the same direction and connect in the same polarity to your battery.

In winding the magnets place a thin piece of paper between each layer using shellac to hold it in place. The core should be of soft iron for best results.

FINISHING HOME-BUILT FURNITURE

How can I get a good finish on my home constructed furniture?—J. O. V., Paris, Ill.

After each coat of varnish or varnish stain has dried thoroughly, rub down with 00 or

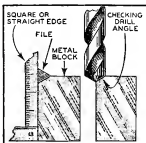
finer sandpaper. After sanding the last coat, rub lightly with pumice stone and follow with rotten stone. The rotten stone will produce a satin-like finish. If a high gloss is desired, polish with furniture polish. Three coats of varnish or varnish stain should be applied.

The following is more difficult, but even better than the first. Apply one coat of stain (not varnish stain) and wipe off before it has time to dry. Follow with filler on open grain woods, then apply a thin coat of shellac and finally two coats of clear gloss varnish. Sand the shellac and varnish coats completing the job with pumice and rotten stone as above.

DRILL GAUGE CORRECTION

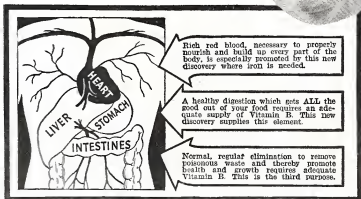
The short article on the making of a drill sharpening gauge appearing on page 96 of the January, 1936 issue of *Modern Mechanix* gives the angle of the file notch as 60°. On several occasions I have heard that the usual types of twist drills are tapered to 59°, or a total of 118°.—D. E. D., Newport, R. I.

In cutting the drill sharpening gauge a file notch of 60° can be used to check drill sharpening angles, but the three cornered file must be placed flush with edge of the steel block used for checking the drill as shown in the accompanying drawing. The resulting angle is 60°, only one degree off from correct gauge.



Editor's Note: Your questions on any problem will be answered personally and free of charge by M M's experts if a stamped addressed envelope or reply card is enclosed. Names and addresses of manufacturers of new products described in this issue can also be obtained free on request. Address: Problems Editor, Modern Mechanix Publishing Co., Pascoett Building, Greenwich Conn.)

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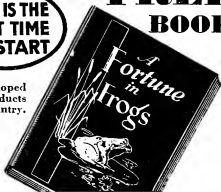


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FOR INVENTORS And Mechanical Minded Men

How TO OBTAIN A

Answers to Questions on Page 125

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- 2** Send sketch or model and description with search fee to a registered patent attorney.
- 3** 1101 U. S.—1279 Foreign.
- 4** Abraham Lincoln.
- 5** 17 years.
- 6** It confers on patentee the exclusive right to make, sell and use the invention covered by the patent.
- 7** No. Pencil sketch and description will usually suffice.
- 8** A form on which an inventor may execute his sketch and description. When properly filled out it is documentary evidence of your conception of the invention.
- 9** Because a layman or a lawyer in general practice is not learned in patent office practice.
- 10** As soon as patent application covering the invention is filed in United States Patent Office and official receipt received.

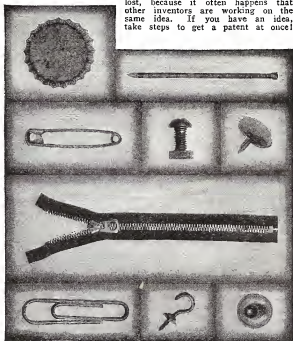
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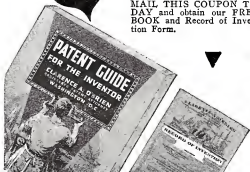
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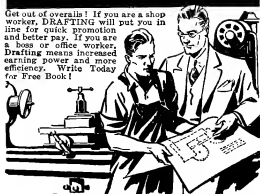
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Random Chips from

THIS is the MM's Big Cash Contest issue offering you at least five chances to win prize money. We won't go into detail here as each contest is covered thoroughly on other pages, but we will point out that with one of the top prizes in the \$1,000.00 Auto Identification contest on page 42 you can equip a complete workshop. There's your opportunity to get that ideal shop.

This may look like an auto trailer and boat issue from the photos appearing in this department. The outdoor season is hard on our heels now, and some readers were far-sighted enough to shoot in photos on spring subjects to take this month's prizes.

Albert Bauman of Queens Village, N. Y., sent us a batch of fine photos and an interesting four-page letter to win first prize of \$5.00. We will quote as much as possible:

Dear Editor:

With this letter I am enclosing photographs of the "Bungalow" trailer which I built from MM plans. It has proved well worth the time and money invested and has paid for itself in money saved in a 3,500-mile trip taken by five

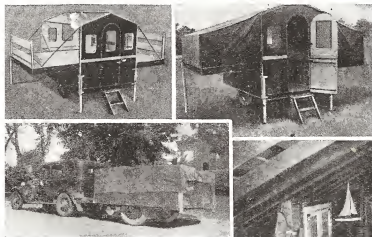
members of my family and myself last summer.

Having our "home" with us wherever we went, we could take our time and stop when and where we felt inclined and almost always succeeded in finding a nice, secluded spot. The trip covered twenty-two days and the total cost for parking both car and trailer during the entire trip was only \$2.50. The cost of gas and oil was approximately \$4.00. We purchased food and groceries and cooked and ate our meals just as we would at home.

The trailer was towed by a 1931 Chevrolet sedan. Most of the hills were taken in high gear and the really steep mountain roads were negotiated in first gear going up and in second gear going down. The average gas consumption was about 16½ miles per gallon.

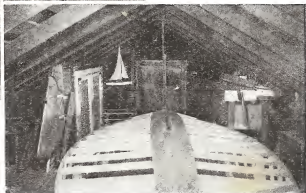
The chassis of the trailer consists of a 1927 Chevrolet front end with frame and cross-members constructed of Model T Ford frames. It was found necessary to add two extra leaves to each spring as the springs were too weak.

The rest of the trailer was built according to the plans. There are three mattresses. An awning maker made a fine tent for the body of ten-ounce waterproofed canvas. I used only first class lumber cut to size and shape at the mill. In every instance parts were bolted and screwed together, no nails being used. The



Three photos at left of Bauman's "Bungalow" trailer show trailer open without canvas covering, canvas covering in place at camping ground, and trailer folded ready for touring behind car. Below—Rabl's 4-in-1 boat *Nomad*, under construction in the attic of the home of A. D. Pittinger, winner of third prize of \$2.00. On the bench is a model airplane, on back wall is a model balsam sail boat built from MM plans, and just below it is a rear wing frame of a 6½" gas-powered model plane.

These three photos and an interesting letter from Albert Bauman were awarded first prize of \$5.00 this month. Bauman traveled 3,500 miles in this MM "Bungalow" trailer from Long Island, New York, through Washington, D. C., the Shenandoah Valley, Indiana, Illinois, to Wisconsin, returning through Cleveland, Buffalo, Niagara Falls, and the Catskills. "Bungalow" is one of the six trailers described in MM's free blueprint catalog.



the Editor's Workbench

entire cost of the trailer was \$215.

The feature article I like best in the current (February) magazine is "Engineered Safety in the Triborough Bridge." I least enjoyed "Tackle for Ocean and Gulf Fishing." The "how-to-build" article I like best is "Skate Sailing." I least enjoyed "Mechanical Card Tricks."

Albert Bauman.

That is one of the most practical and helpful letters received by this department. Any builder contemplating "Bungalow" Trailer knows beforehand from the above letter what the trailer can do, what it will cost, and the problems that were overcome. We suggest that readers submitting letters to this department keep in mind that other readers are building or are planning to build the same thing. The three letters and photos, judged the best received during the month, are awarded \$5.00 for first prize, \$3.00 second, and \$2.00 third.

Builders of the 18-foot auxiliary cruiser *Buddy* can increase her sail area by following a new sail plan drawn by her designer, Sam Rabl. The sail plan blueprints can be obtained from MM for 50 cents.



This canoe sail rig was built according to MM plans by Wesley DePue, winner of second prize of \$3.00. The rig, used all last summer, brought many favorable comments, he says.

Wesley M. DePue's letter, winner of second prize of \$3.00, contains some good tips. We quote:

Lima, Pa.

Dear Editor:

Enclosed you will find some pictures of a sail-rigged canoe built from plans published in the July, 1934, issue of MM (also published in new edition of *How to Build 20 Boats*).

I made a slight change in the lee boards by boring eight one-inch holes in each board near the bottom edge and filling these with lead. Before doing this the lee boards had a tendency to float too high in the water and the canoe would drift off her course. I also secured a small rope to bottom edge of each lee board and ran it through a small pulley, attached

to the gunwale, aft to within reach of stern seat. This makes an excellent way to control depth of lee board.

Boat fans will know that I cannot make a higher compliment than to say she is smooth riding in rough water and will tack within 20 degrees of the wind and hold her course.

In the February issue I like "Flying the Fifty-Ton Pacific Clipper" best and do not dislike any particular article.

Wesley N. DePue.

[Continued on page 31]



Above is MM's gas-powered model plane built by Brenard Lawrence of Bluefield, W. Va. Lawrence planned to give it a test-hop as soon as the snow was off the ground. At right is Dick Cole's "Foursome Flexible Flyer" bobsled, described in the December, 1935, MM and in the 1936 *How to Build It*, as built by Leon Pickell of Greenville, Mich. This was Pickell's first MM project. He says: "As a whole the bobsled and your wonderful magazine are certainly tops with me."

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Chips from the Editor's Workbench

[Continued from page 29]

Karl Oksanen of Sudbury, Ont., built an MM radio with these results: "I built the two-tube all-wave electric set the plans of which appeared in the January, 1935, MM (also in *Radio Builders' Manual*). I have logged long and short wave stations all over the U. S."

John E. Roberts, writing from South Rhodesia, Africa, built the same set and reports, "It works wonderfully. I would also like to hear from other readers of MM who are interested in radio." Write him c/o H. Perrern & Son, Untali, South Rhodesia, Africa.

Third prize of \$2.00 was awarded to A. Dean Pittinger not so much on the basis of the quality of his photograph, but because his letter clearly showed how difficulties can be overcome. He tells us this:

Los Angeles, Calif.

Dear Editor:

I am building *Nomad* in the attic of my rented home. The landlord was kind enough to let me tear out part of the end of the attic to remove it when I get it finished. I will turn it on edge and remove it through the window seen in the photograph. I am using the best materials and am using white lead in all the joints. I plan to use the racing sail plan, but will have a larger cockpit.

Nomad is about the same as a cat boat called *Snowbirds* here on the coast. I hope to be able to run away from them in all kinds of weather. If she is fast enough I want to enter the Hi-N-Dri Yacht Club's race to Catalina Island for *Snipes* and under.

I can't stand erect in the attic, but who cares? I am a little crowded. There is about three feet of space in front and five feet at the rear of the boat.

A. Dean Pittinger.

Nomad, you may recall, is Sam Rabl's four-in-one boat design. It is one of the twenty plans included in *How to Build 20 Boats* now on sale at 50 cents a copy.

Inventors are now receiving certificates, suitable for framing, officially confirming their membership in the International Society of Modern Mechanix and Inventors. The Society originally was organized for club groups of five or more members, but recently opened its membership to individual inventors. Application blanks can be obtained on request.



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Gentlemen: Rush to me, FREE of charge, list of U. S. Government big pay jobs. Send me FREE 32-page book describing salaries, vacations, hours, work, sample coaching tests and full particulars on how to get one of these jobs.

Name

Address

How a Challenge Made Me Popular!

"A box of cigars says you don't DARE dance with her—Wallflower!" That was the challenge they flung at me! My sporting blood boiled! "All right, I accept!" I responded. And I started across the floor.

I NEVER was much of a dancer. But when our club gave this affair I couldn't stay away. Even now I should have been sitting on the "sidelines" if the fellows hadn't made that sarcastic remark.

"Show them you can dance as well as they!" my pride whispered.

But halfway across the hall my courage died. There she was, waiting expectantly—Marion Blake, an exquisite dancer. Suppose she should refuse?

The Unexpected Happens

"I'm—I'm sorry"—I stammered. "I guess—"

"Why, of course, I'll be glad to dance!" And before I realized it we were swallowed up in the dancing throng.

What a terrible ordeal it was. And twice as bad for her. I stumbled through the steps. I trod on her toes. Suddenly she suggested that we sit out the rest of the number. "Now it's coming!" I thought. "Jim," she began softly. "I'll be frank. You're not the best dancer in the world. What you need is 'brushing up' on the latest steps. Why don't you get in touch with Arthur Murray?"

"Arthur Murray!" I exclaimed. "He teaches dancing by mail. You can't learn that way!"

"No?" smiled Marion. "That's exactly the way I learned."

If Marion could become a wonderful dancer that way it was certainly worth investigation—especially since I didn't risk a penny.

What a surprise the lessons were! In a few evenings I had learned the modern Waltz—the modern Fox Trot, and many delightful variations of the very latest steps—without music, partner or teacher.

I Turn the Tables

A week later I attended a dance. The old crowd was there. "Here he is again!" they chorused. "Give him the cigars! He earned them!" Imagine how surprised they were when I asked Marion to dance! They stood open-mouthed as I glided around the floor like an expert!

And today, everywhere I go I am welcome as an accomplished dancer!

**REGULAR \$5.00 COURSE
NOW ONLY \$1.98**

Arthur Murray is so positive that you, too, can become a good dancer and get your full share of fun and popularity by learning to dance well through his new, easy method that he is willing to send you his regular \$5.00 course for only \$1.98.



5 Days Trial

Mail this coupon, and the regular \$5.00 course will be sent you immediately. Pay the postman only \$1.98, plus few cents delivery charges. Then for five days—study it—practice the steps.

See how easy it is to become a finished dancer—sought after, popular.

If you're not delighted with results, return the course within five days and your money will be promptly refunded. Don't wait—you owe it to yourself to clip and mail this coupon NOW! Arthur Murray, Studio 171, 7 East 43rd Street, New York.

**ARTHUR MURRAY, Studio 171
7 East 43rd Street, New York, N. Y.**

To prove that I can learn to dance at home, you may send me your famous \$5.00 course for only \$1.98, plus few cents postage. I understand that if not delighted I may return the course within 5 days and my money will be refunded.

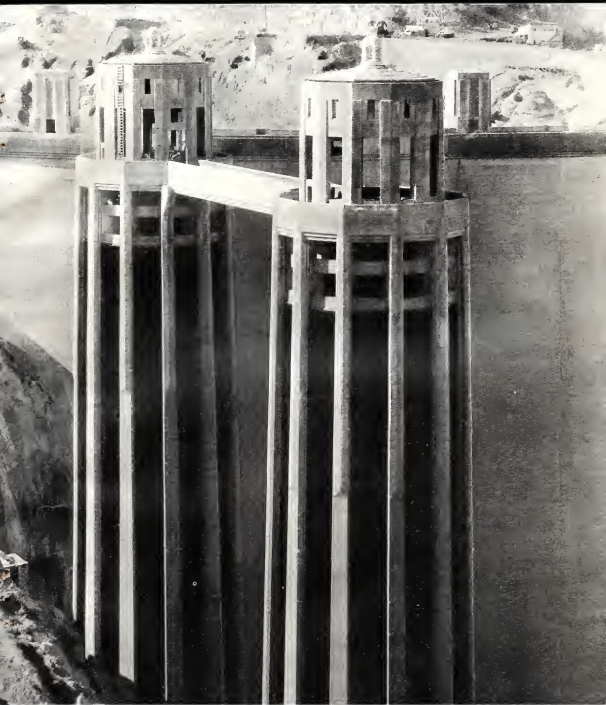
Name

Address

City State

NOTE: If apt to be cut when postman calls, send \$2.00 with coupon and save C. O. D. postage.

Behind These GATES Lies POWER



Boulder Dam's mighty intake towers, 395 feet high, hold back an inland sea more than one hundred miles long, regulating the flow of water to the mighty turbines driving super electro-generators. Gates within the towers, each weighing 240 tons, will control the electric power supply for the entire West. Four million pounds of steel were used in construction of dam.



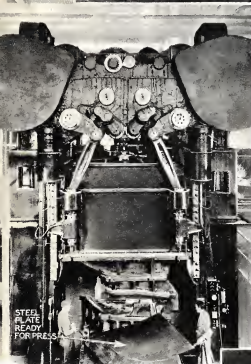
Sketches at side and top show steps in the design of the million dollar automobile from the original artist's drawing to the full size projection of the miniature model. Above is a photo of full-size rough plaster dummy made from drawings of new auto model.

by DONALD G. COOLEY

THAT shiny, streamlined 1936 motor car that you bought for a few hundred dollars cost its manufacturer one million dollars!

In all the story of modern industry there is no more arresting miracle than this. The million dollar car differs in only one respect from its moderate-priced brothers on the highways—it is completely hand built. Into it goes genius of the highest order. It is the master model of skilled designers which serves as a pattern for mass production.

Behind the creation of this hand-made car lies the fascinating romance of modern automobile design. Hundreds of artists, sculptors, engineers, draftsmen and master craftsmen combine their talents in the designing rooms of the major manufacturers to produce new cars which will satisfy the requirements of the American motorist. At this very moment the 1937 motor car is taking shape under the hands of sculptors



The giant press above packs an 800-ton whelp as it forms the rear quarter panel of a Ford Tudor sedan body in one operation. The machine produces four panels a minute, is 25 feet high, weighs 600,000 pounds. Right—Full size blackboard drawing in the Seamen Body Corporation. Details are worked out in a specially made plaster dummy.





ENGINEERING

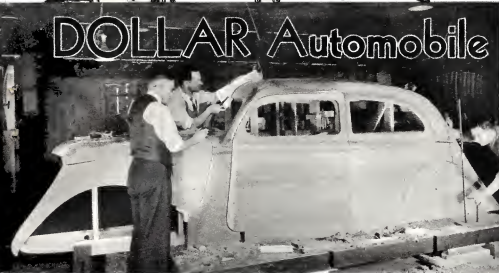


LINE ASSEMBLY



TESTING

DOLLAR Automobile



After the plaster dummy is approved, a handmade full-size wood model is built to be the pattern used for new dies for actual manufacture. Note workmen checking roof curve of Nesh model with template. Sketches show different steps from engineering department to proving grounds and sales room.



SALES



and mechanics. If the art of the sculptor seems far removed from that of the automobile engineer, it is because the average motorist is unaware of the revolution in design methods which followed the popularity of streamline models. In years gone by the motor car was born and reared to lusty manhood on the drawing board of the draftsman. It was a method inherited from carriage manufacturers, and it sufficed as long as the automobile was a more or less square body set on wheels.

But today, although the drafting room is still indispensable, it is the artist who is supreme in matters of design. The actual design of a new car is no longer a series of drawings, but a life-size model of mahogany or plaster mounted on a chassis. No Greek sculptor ever lavished more loving care on the statue of a goddess than artists expend on the creation of a plaster car which will be reproduced thousands of times in a complex, living mechanism of steel, glass and rubber.

The drafting room is still the birthplace of the motor car. Step into the design rooms of any automobile manufacturer and you will find hundreds of draftsmen working over long tables, and copying designs on huge blackboards large enough to take a full-scale automobile drawing. Thousands of pencil sketches are being made—drawings of



Interior as well as exterior of the wooden dummy automobile is carefully built to show exactly how much room there is for the driver, passengers, instruments and fittings.

fenders, radiators, louvers, hood lines. Thousands of them are discarded as the process of refinement goes on, but those which are most pleasing are projected full size upon the blackboards.

Giant Pendulum Finds Car's Center of Gravity

"Tens of thousands of dollars go into pencil sketches alone during the course of a year," explains N. F. Hadley, chief engineer of the Plymouth Motor Corporation. "Such is the cost of research engineering that if all development charges were carefully assessed against a new model, a million dollars would hardly cover the cost of turning out the first hand-made car."

These sketches are only the beginning. A drawing can show a streamlined curve only as a flat line. A mechanical drawing, for all practical purposes, must reduce three dimensions to two. As long as the automobile remained a vehicle of straight lines and flat radiator, the method was satisfactory. But today's streamlined car is much more than a profile or a flat plan drawing. It is a creation of rounded, odd-shaped curves in which the vital highlights must flow unbroken from radiator cap to tail light.

Only the sculptor and the model-maker can translate a drawing into a satisfactory picture of the car. When a design has reached the blackboard stage, the model-maker comes into his own. He makes a miniature model in clay, accurate to the finest detail. Awkward lines hidden in the drawing immediately become apparent. Refinements are made—a fender may be redesigned to blend into the body lines, the radiator lifted or lowered, the windshield tilted at just the proper angle. The miniatures, about one-fourth size, are studied in wind tunnels, a device borrowed from airplane engineers, and any obstructions in streamline form are removed.

Now comes the task which calls for the very highest degree of artistic and mechanical genius—the making of a full-sized model. Everything depends

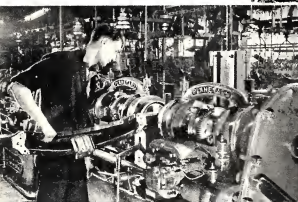
upon it—the success of the manufacturer in pleasing his customers, the jobs of thousands of men, the comfort and safety and even the life of the eventual owner.

From this model will be made the dies which reproduce the car by the mass production methods which have made the American automobile industry a world-wide standard of efficiency. The line assembly system first developed by Henry Ford in the production of the Ford car has for years been used, with their own variations, by all the major motor car manufacturers.

"Under the present system of design the full-sized model is really the design," says H. H. Seaman, chief of body production for Nash and Lafayette cars. "All other steps are only incidental. Working in actual size, the model is carved into exactly the form that is desired. A plaster dummy is mounted on a frame with wheels, with plaster dummies of hood and fenders. It is smoothed and polished, and even painted and rubbed down, exactly as an actual body would be



New model's center of gravity is determined on this huge pendulum. Time required to make a complete oscillation is recorded and, following Galileo's law of the pendulum, car's center of gravity is found quicker than by mathematics. Left—Before these mass production machines begin operation all phases of automobile design must be worked out in drafting room and in model by artists and engineers.



Shadows on Squares Show Driver's Blind Spots

Borrowed from aeronautics is the wind tunnel (right) to test the small automobile model to insure perfect streamlining.

finished, until its lustre brings out the highlights."

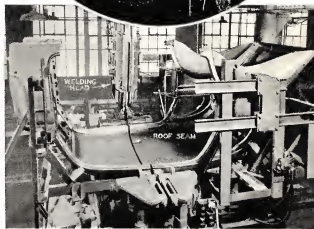
The model maker uses the blackboard drawing to follow the silhouette and principal flow lines, but little else. The draft is not a complete mechanical drawing, but a simplified full-size layout intended to make sure that the model will be built within specified limits of wheel-base and engine space.

Curiously enough, the observer never really sees the lines of the streamlined automobile, but only the highlights reflected from its curved surfaces. Thanks to the modern absence of straight lines, the apparent silhouette of the car changes when viewed from different angles. For this reason the plaster dummy must be hand-shaped to the minutest fraction of an inch in order that the highlights may sweep in an unbroken line. High spots are carefully shaved down, low spots built up to eliminate the slightest distortion of highlights.

Interior accommodations, the placing of seats, instruments, and gear levers is carefully checked in the dummy. When finally completed, the dummy is an exact replica of the car-to-be.

It is not, however, from this model that the dies for production are made. For this purpose another dummy is built of wood, usually mahogany. It must be a faithful reproduction of the plaster model without a hair's breadth deviation. This operation is perhaps the most critical of all, for both sides of the car must be exactly matched, and since the wood dummy is unpainted, the trained hand of the craftsman is the only

[Continued on page 133]



Circle—How General Motors tests visibility. Shadows reveals driver's blind spots. Photo above shows completed steel body in Nash-Lafayette plant turned upside down. Two sections of body are welded into one-piece unit. Left—The completed body. Dies for various sections are cast from molds taken from wooden dummy.



Stout Designs Compact Folding Home for Trailer Travelers



Left—William Stout, famous automobile designer, steps from his latest creation, the mobile home. Center—The mobile home opens up into a full sized bungalow, easily brecced with jacks. It even contains twin bedrooms. Right—Ready for the open road. It pulls as easily as a trailer.

IT IS not a house, and it is not a trailer, but it is a combination of both. Thus is described the new mobile home designed by William B. Stout, famous airplane and motor car designer.

As a trailer the new home is 16 feet long and 6 feet, 6 inches wide, and is carried on two automobile wheels mounted on a drop axle. Installed at the lake front or camping grounds, the trailer blossoms into a home with a living room 20 feet by 14 feet and a fully equipped kitchen. Twin bedrooms can be arranged also.

Squirt Guns Mark Rioters With Ink

IN THE midst of brandished clubs and flying bricks hurled by rebellious students, the police of Cairo, Egypt, uncorked a new riot quelling weapon—a giant squirt gun.

The Egyptian riot squirt gun differs from the conventional toy weapon only in its contents. It is loaded with ink. With one blast of its nozzle all the rioters within range are indelibly sprayed from head to foot with the fluid, and participants are readily identified.



Rioting Egyptian students found their demonstrations effectively discouraged by squirts of ink as this drawing illustrates. The indelible ink identifies the rioters for days.

Airport Levels Snow With Rollers

INSTEAD of laboriously attempting to clear several acres of airport after a heavy snowfall, officials at the Bradford, Pa., air terminal decided to flatten out the drifts with a roller. The result was a smooth, hard packed field that offered no obstacles to pilots seeking a landing.

14th Family Plane Enters Contest



This is the latest of the 14 planes now entered in the government's search for a fool-proof plane. It weighs 1,200 pounds, and is powered with a standard automobile engine.

FROM Hannibal, Mo., comes another entry in the government's contest for a light, fool-proof family airplane. Hayden S. Campbell is the designer.

The new craft has a speed of 125 miles an hour and burns but one gallon of gasoline for every 24 miles. The motor is a standard automobile engine. In starting it is only necessary to turn on the ignition, step on the starter and wait a few moments for engine to warm up.

The interior of the cabin is much like that of an automobile. In recent tests the plane was demonstrated to be fool-proof.

Bottled Milk Capped In Steam; Stays Fresh 3 Months

MILK, a commodity so perishable that 625 cities have ordinances requiring that it be sold within 36 hours after bottling, can now be kept sweet for more than 3 months through a new process developed by William P. White of Chicago.

In the new process bottles of pasteurized milk are passed into a chamber of dry steam. The steam creates a vacuum, drawing off the air above the milk, and at the same time sterilizing the surface of the milk. The bottle is then capped with an air-tight seal.

When sealed in this manner the milk remains fresh for months, the only requirement being that it be stored in refrigerators instead of on open shelves.

Glass Dishes Withstand Open Flame



Here is the new glass skillet which will not crack even when left dry over a hot flame. The handle is detachable, and then the frying pan becomes an attractive serving dish.

GLASSWARE so strong and heat resistant that it may be used as readily as metal on top of a hot stove is the latest contribution of science to the housewife. The new glass, the result of testing 1,500 kinds of glass over a period of several months, is light in weight, and will not crack even when left over the open flame while dry. Food can be served on the table without removal from the dish.

Magazine, April, 1936



Milk sealed in this new machine will keep fresh for months. Here William White, the inventor, shows how the milk is capped in a dry steam chamber which gives it a vacuum seal.

Two Scientists Discover Vitamin H

AFTER 8 years of constant research, Dr. Luther R. Richardson, agricultural chemist, and Dr. Albert G. Hogan, professor of Animal Nutrition, both of the University of Missouri, have been successful in isolating vitamin H, the seventh vitamin discovered by science.

While vitamins are present in almost all foods, it has been only in recent years that their actions have been understood. From them science expects to learn much that will contribute to the advancement of the race, physically and mentally.



Dr. Luther R. Richardson, left, and Dr. Albert G. Hogan, right, are the scientists who were successful in isolating vitamin H. Their discovery will contribute much to dietetics.

\$1000⁰⁰ CASH

Do You Know



The Name of This Car Is

ON THE streets of every city and on the highways in every section of this country thousands of automobiles roll by. Do you know them? Can you say "That is a Ford, that is a Chevrolet"? If you can you have a good chance of winning one of the 183 cash prizes in this novel \$1,000.00 contest.

Even if you can not recognize cars now, you still have an opportunity to win one of the big cash prizes. The photographs published in this contest will show the feature or features by which popular makes of automobiles can be identified. Each photograph represents a different type of car. These cars can be seen on your street or highway, or in the showrooms of your local dealers.

Before starting the contest, be sure to read the rules carefully. Note that no entries will be accepted unless all twelve pictures are included. Do not mutilate the pictures or

THE QUESTIONS

ANSWER THESE QUESTIONS

1. What is your age and occupation?
2. Do you own an automobile?.....
What make? What year?
3. Do you plan to buy a new car?.....
When?..... What make?.....
4. Approximately how many miles do you travel in your car annually?.....
5. What brand gasoline do you regularly buy? What oil?
What tires?



The Name of This Car Is

change the shape or size of them in any way. Simply paste each down on a sheet of paper and fill in the name of the car in the blank line under each picture.

This contest gives you an opportunity to show your originality in the "Safety Slogan" of ten words or less required from each contestant. Do not neglect this part of the contest. It will be one of the points considered by the judges.

The "Safety Slogan" need not be difficult.

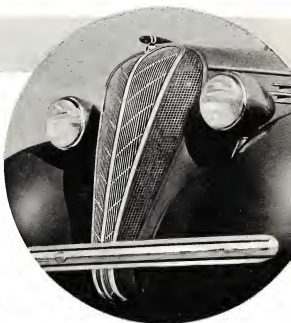
Modern Mechanix & Inventions

PRIZES FOR YOU! \$1000⁰⁰ Automobiles?

THE PRIZES

First Prize	\$250.00 IN CASH
Second Prize	150.00 IN CASH
Third Prize	100.00 IN CASH
5 Fourth Prizes	25.00 EACH
10 Fifth Prizes	10.00 EACH
15 Sixth Prizes	5.00 EACH
50 Seventh Prizes	2.00 EACH
100 Eighth Prizes	1.00 EACH

TOTAL—183 PRIZES \$1,000.00
IN CASH



The Name of This Car Is



The Name of This Car Is

THE RULES

- 1 Cut out each photograph and in the space below it write the name of the car from which the identifying feature was taken.
- 2 DO NOT MAIL YOUR ENTRY UNTIL ALL TWELVE PHOTOGRAPHS HAVE BEEN PUBLISHED.
- 3 Answer accompanying questions. Your replies to these questions will not be considered by the judges, but to be eligible each entrant MUST answer the questions. eligible each entrant MUST answer the questions.
- 4 In ten words or less state your "SAFETY SLOGAN." The originality shown in the "SAFETY SLOGAN" WILL BE CONSIDERED by the judges. The "Safety Slogans" are to become the sole property of Modern Mechanix Publishing Co.
- 5 This contest is open to everyone except employees of Modern Mechanix Publishing Co.
- 6 You don't have to buy a copy of this magazine or be a subscriber to enter this contest. Recognizable facsimiles of the photographs will be acceptable.
- 7 Contestants need not submit elaborate entries. Neatness, brevity, and accuracy will be the deciding factors. No entries will be returned.
- 8 The editors of this magazine will be the judges. Their decisions are final. In case of ties duplicate prizes will be awarded.
- 9 Mail your entry to the AUTOMOBILE CONTEST EDITOR, Modern Mechanix Publishing Company, Greenwich, Conn. Write your name and address clearly on your entry. To be eligible entries must be postmarked on or before June 1, 1936. Winners will be announced as soon as possible after the close of the contest.

All of us have ideas on how to reduce automobile accidents; we think we know why the other fellow is at fault; we have definite ideas on improving traffic conditions in the cities. Express your safety ideas on any phase of automobile driving in ten words or less and include it with your entry.

You can write your "Safety Slogan" while waiting for the remaining photographs which will be published in the May and June issues.

Magazine, April, 1936

Invisible Sound Makes Appearance For Magic Camera



For the first time sound is photographed. At left a bullet whines between two plate walls. The trailing ripples are caused by vacuum. Above—Sound waves, produced by spark gaps, spread in smooth circles.

SOUND, regarded as invisible in everything save its waves as registered upon photo-electric cells, has been made visible to the camera's eye. This great scientific accomplishment, made possible by a highly technical arrangement, visually confirms many theories concerning sound impulses.

With the aid of the camera it is possible to show sound radiations spreading through the air like the ripples formed by dropping a pebble in calm water. A bullet passing beneath the camera lens disclosed the sound waves parting

from its nose and bouncing against plate walls like light against a mirror. The theory behind the new process was developed by the eminent physicist Toepler in 1864, but the method of applying it has just been discovered.

Winter Olympics Thrill Thousands

SCIENCE and engineering joined forces to provide the most spectacular features of the Winter Olympics held in Germany, bob sledding and ski jumping. Into the scientifically designed, ice banked curves of the runways engineers put all the skill that was at their command, while their work on the ski scaffold make possible jumps of more than 250 feet.



A tense moment for the skier and the thousands of spectators. Here the skier is picking up momentum on the downward swoop which will carry him more than 250 feet through the air.



Vertical banks on the spectacular bobsled run were made of ice blocks sprayed down at night with water. Below—The height of thrills! A bobsled team takes a dangerous S curve.

Atom Smasher Makes Radium; Transmutes Gold Into Mercury

AN ATOMIC race track, capable of producing artificial radium bearing the same properties as the \$1,000,000-an-ounce metal, has been built at Cornell University at a cost of but \$5,000.

The new machine, called the cyclotron, meaning atomic race track, uses 2,500,000 volt magnetic rays to impregnate common table salt or any of several different metals with artificial radium rays. The impregnated materials remain radio-active for several hours. In the case of molybdenum, this radio-active period lasts for several months.

Within the cyclotron electrically charged particles no larger than atoms are set to whirling in a magnetic field, developing speeds of thousands of miles a second. At this speed they are dashed against targets and the atoms are smashed. Gold has already been changed to mercury by this machine.

The cyclotron will be used to further radium studies in medicine, biology, and physics. Because it can be built so cheaply several universities are planning to install one.

Spindle Shaper Built for Amateurs

A NEW spindle shaper enables amateur craftsmen to do work hitherto possible only on expensive machines. It comes equipped with cutter guard and straight wrench.



This new spindle shaper for amateur or professional fits any standard cutter of 3/16" bore.

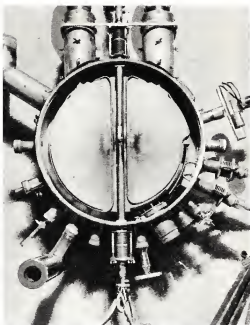
Snipper Clips New Keys By Code



This device cuts duplicate keys with one snap of the handles.

AUTOMOBILE keys can now be cut as quickly as snipping a wire. Cutting edges of the device is set to key's code number, and the key is cut.

Magazine, April, 1936



Looking down upon the heart of the new atom smasher built at Cornell University. Here atoms will be whirled around at thousands of miles per second, assuming new characteristics.

Knee Throttle Replaces Foot Feed

A NEW type of gas throttle for automobiles uses knee pressure instead of foot pressure in providing an even flow of gasoline to the motor. The invention claims for its features a great advancement in safety by permitting the driver to rest his right foot on the brake instead of the foot throttle, and greater driving ease.

The new throttle lever is stationed beneath the cowlings with an extension arm reaching to the driver's left knee. The lever folds out of the way when door is opened. Knee control is said to be as easy as foot control.



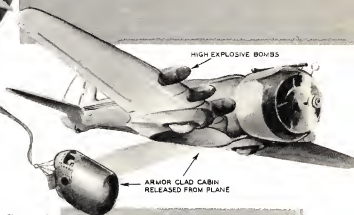
The use of this knee throttle enables the driver to keep his right foot on the brake at all times. Inset shows a close-up of throttle. It folds out of the way when door is opened.



REVEALED-

Battle Tactics

The suicide squad will be replaced by the volunteer prisoner who will aim his bomb-loaded plane at a target, turn it over to an automatic pilot, and bail out before crash in armor clad cabin. After landing pilot will be seized as a prisoner.

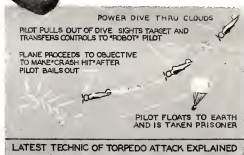


REFERRING to airplanes in 1912, General Ferdinand Foch, witnessing the historic *Circuit de l'Est*, exclaimed: "That is fine sport but for the army it can be of no possible use." Three years later this promising experiment among modern war tools was dumping bombs upon Paris and London. Dog fights in the air were taking place over the western battle front and the great Field Marshal of the World War was having a busy time of it dodging bombs, converting field guns into ridiculous anti-aircraft weapons and trying with little success to conceal Allied military movements from the prying lenses of the flying photographer. War in the air, long-predicted by imaginative fiction writers, had become a reality!

Today the average man in the street is well-aware that the airplane is a devastating military weapon that has scrambled most of the previous conceptions and traditions of war. But it is very doubtful if he has any adequate appreciation of the enormous strides that have been made in recent years in the tactics and strategy of military aeronautics or the gravity of its relationship to other wartime activities.

In order to discuss this subject intelligently we must bear in mind that the goal of any war is the destruction of the enemy's military forces and the crippling of his war efforts.

Today every major world power reckons its military strength largely in terms of aviation



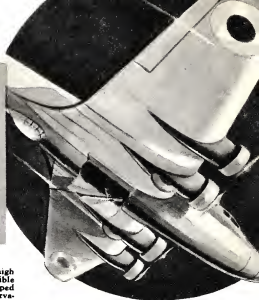
Parachute attached to cabin will permit pilot to escape from loaded plane a few seconds before the blast. Drawing above shows how bombs may be faired into the wing of ship.

and there are many valid reasons for so-doing. No nation admits that aircraft have in any way eliminated the time-honored functions of armies on the ground or navies on the seas. Yet all are agreed that aviation has injected a figurative third dimension into any war picture of the present and future. The aerial delivery of bombs, fire and chemicals has made war deliverable to its sources . . . to the plants of industry, its lines and centers of transportation and communication, to the very social, political and economic life that supports it.

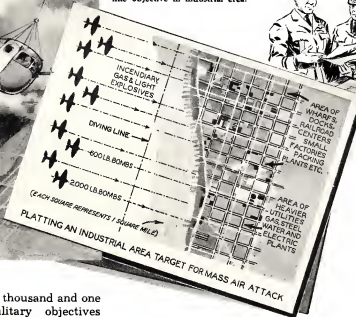
If we grant the recent development of some highly effective anti-aircraft weapons, defensive air forces and the ability of a battle fleet to defend itself against any dissimilar force, we are still confronted with the problem of

by JOHN EDWIN HOGG

of the *FLYING* FLEETS of WAR



While enemy plane flies high above clouds, almost invisible observer (left) will be dropped down on cable to make observations and take photographs of area to be attacked. Attack will be carefully planned in advance with each plane assigned to a definite objective in industrial area.



Intelligence officers are being developed solely for the aerial branch of the army. Aerial attacks will be concentrated, not on battle lines or naval fleets, but on the industrial sources of war materials (left). Attacking bombing planes may fly high above clouds, dive, release destructive charges on plants, and escape into clouds. Planes with lighter bombs will drop charges on small plants.

defending a thousand and one other military objectives slated for destruction by enemy air forces in time of war, forces that can strike with bewildering speed and without warning at objectives hundreds or even thousands of miles behind battle lines.

It is against such targets . . . the plants of war industries, lines and centers of transportation and communication, troops on the march or in concentrations, the far-flung public utility systems without which great industrial areas would cease to function that the tactics and strategy of modern aerial warfare is now largely aimed. Military experts are for the most part in agreement that battle

lines on the ground, land fortifications, navies on the seas and similar objectives well-defended against aerial attack can best be left to more orthodox methods of war while air forces operate to kill or cripple the enemy's war preparations at their sources.

For operation against such objectives the tactics and strategy of modern aerial warfare recognizes essentially three types of targets. These are linear, area, and precision targets. A division of infantry strung out over a highway, railways, pipe lines, electric transmission lines, aqueducts, and canals are typi-

Industrial Targets Aim of Air Attackers

U.S.A.

THE TYPE B-10 MARTIN BOMBER FORERUNNER OF WHAT IS NOW ACCEPTED PRACTICE IN BOMBER DESIGN, ITS INFLUENCE CAN BE TRACED IN ALMOST ANY U.S. OR FOREIGN BOMBER PRODUCED TODAY

JAPAN

MITSUBISHI BOMBER SHOWS DEFINITE AND CHARACTERISTIC TRAITS OF EUROPEAN DESIGNS

Modern bombers of great powers have similar characteristics in that they combine high speed with heavy load-carrying capacity. Drawings at bottom of page show typical targets with aim to cripple enemy.

cal linear targets. Area targets are such things as troop encampments, industrial districts of metropolitan centers, oil fields and oil tank farms where masses of objectives are closely grouped in concentrations. The precision target is a bridge or other definite point upon which bombs must be dropped. A great variety of tactical maneuvers have been developed for the wartime raiding of such objectives, each aiming to accomplish maximum destruction with minimum risk to attacking forces.

For the purpose of illustrating this article there are no photographs depicting tactical phases of military aviation. It is a physical impossibility to make such photographs either from aircraft or from the ground. The so-called military aircraft maneuvers that the public has witnessed and all the photos and

FRANCE

BREGUET 460-CLAIMED TO BE WORLD'S FASTEST HEAVY LONG-RANGE BOMBING PLANE-

COMING EVENTS IN AERIAL WARFARE

1. The 5,000-mile bombing plane carrying 10 or more tons of bombs, incendiary materials or deadly chemicals of the persistent type.
2. The flying torpedo . . . radio controlled.
3. The flying torpedo, man-piloted by a crew that will abandon ship via the parachute route a few seconds before striking.
4. Semi-armored airplanes in which crews and vital machinery will be protected against gun fire and anti-aircraft defenses.
5. Further development of smoke screens laid by aircraft to conceal air raiders.
6. Intelligence airplanes capable of operating at 25,000 to 30,000 feet, carrying an observer-photographer at 1,000 feet in a bullet-proof "spy car" on steel cable.
7. Propaganda airplanes with printing presses and loud speakers aboard, flying blind under cover of fog and clouds over enemy metropolitan areas distributing printed literature and verbal information a warring government seeks to suppress.



TROOPS ON MARCH



FACTORIES



DAMS

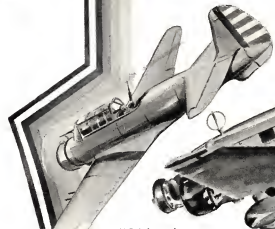


RAILROADS

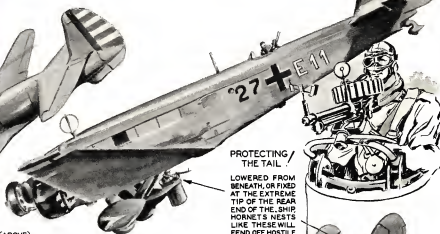


AIRPORTS

Flying Range Increased Ten Times Since War



U.S.A. (ABOVE)
VULTEE ATTACK BOMBER

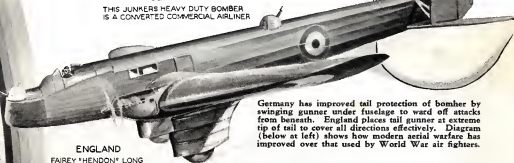


PROTECTING
THE TAIL

LOWERED FROM
BENEATH, OR FIXED
AT THE EXTREME
TIP OF THE REAR
END OF THE SHIP
HORNETS NESTS
LIKE THESE WILL
FEND OFF HOSTILE
ATTACKS IN THE AIR

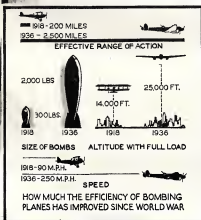
GERMANY

THIS JUNKERS HEAVY DUTY BOMBER
IS A CONVERTED COMMERCIAL AIRLINER



ENGLAND
FAIREY "HENDON" LONG
RANGE NIGHT BOMBER

Germany has improved tail protection of bomber by swinging gunner under fuselage to ward off attacks from beneath. England places tail gunner at extreme tip of tail to cover all directions effectively. Diagram (below at left) shows how modern aerial warfare has improved over that used by World War air fighters.



movies ever made purporting to depict war activities are in reality only the showmanship of air services and movie directors. Let no one think that the tactics and strategy of military aviation is so rooted in folly that air service commanders would send fleets of planes into action in close formation that would enable an anti-aircraft battery to take down a whole formation with a single salvo. Far from it. The science of war in the air contemplates formations so spread out that it is impossible for any camera to cover them—formations that will force the enemy to fight one plane at a time with his defensive air forces and seldom expose more than about one plane at a time to anti-aircraft gunfire. An echelon attack by 30 bombers, for



SHIPPING



GRAIN ELEVATORS



UTILITY PLANTS

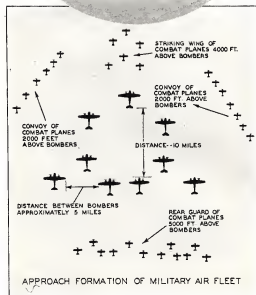
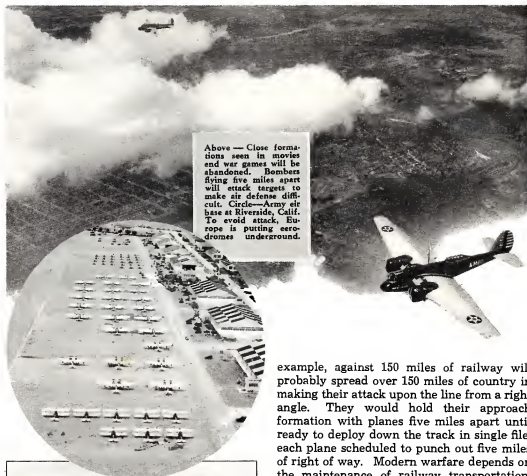


BRIDGES



CIVIC CENTERS

Air Fleets Will Use Formations Similar to Navy



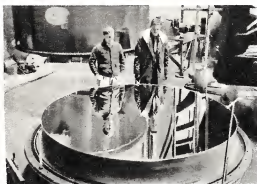
example, against 150 miles of railway will probably spread over 150 miles of country in making their attack upon the line from a right angle. They would hold their approach formation with planes five miles apart until ready to deploy down the track in single file, each plane scheduled to punch out five miles of right of way. Modern warfare depends on the maintenance of railway transportation. Without it armed forces suffer almost complete stagnation for lack of supplies. Yet a railway is one of the most vulnerable targets of aerial attack. The larger a country and the greater its network of railways the more dependent it is upon its railways. Yet it is manifestly impossible to spread enough anti-aircraft batteries and defensive air forces to protect an extensive system of railways from being smashed by enemy air fleets.

Likewise, a mass attack against a highly centralized industrial district will probably never be divided upon by more than about one plane to each square mile of area target. Regardless of the formation that might be

[Continued on page 140]

Left—Like battleships guarded by destroyers and cruisers, air fleets will be guarded by convoys of fast combat planes at side and above bombers which are five miles apart. Flying fleets will not be concentrated in close formations that are easy targets for enemy pursuit ships and anti-aircraft guns.

Aluminum Coat Gives Brilliance To Observatory Mirror



Some idea of how the new 200-inch mirror will look when completed may be gained from this photograph of new aluminum coat of 100-inch mirror at Mount Wilson Observatory.

New 3-Dimension Films Being Shot

THREE dimension moving pictures, the result of an entirely new process, will make their appearance within the next few weeks. The natural vision pictures, incorporating depth with height and breadth, were developed at a cost of \$4,000,000. Successful New York stage plays will be filmed with the original casts as the first offerings.

Pictured Sound Makes Recordings

PHONOGRAPH records made of paper and printed by means of a photographic process were exhibited recently at the Imperial Institute in London. The recording is a photographic reproduction of sound waves which is converted into sound by passing through a new electrical device attachable to either electric gramophone or radio set.



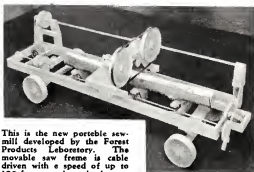
The roll of paper in this machine bears the photographic reproductions of sound waves. They pass before an electric device and are converted into sound by phonograph or radio.

Magazine, April, 1936

BRILLIANCE in the utmost meaning of the word is imparted to mirrors by a new aluminizing process developed by Dr. John Strong and Dr. Enrique Gaviola of the California Institute of Technology.

The first major object to be coated by the aluminum process is the 100-inch mirror at the Mount Wilson Observatory of the Carnegie Institution. So perfect is the reflection cast by the mirror that one sees only the reflections on it, and cannot see the surface. The same process is to be used in coating the 200-inch reflector which is being prepared for the observatory.

Forest Service Designs Band Mill



This is the new portable sawmill developed by the Forest Products Laboratory. The movable saw frame is cable driven with a speed of up to 120 feet per minute in the cut.

A MORE economical and efficient portable sawmill, capable of cutting 1,000 board feet per hour from logs under 24 inches in diameter has just been evolved by the Forest Products Laboratory of the U. S. Forest Service. In operation the log remains stationary while the saw travels its length.

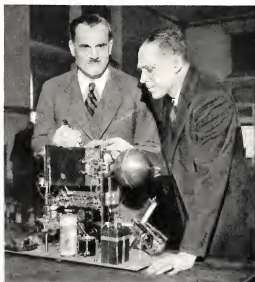
Spiral Strips Reduce Light Glare

SPIRALLED metal strips slipped over the headlight bulb serve the dual purpose of diffusing the light so that there is no glare in the eyes of the approaching driver, and distributing it over the road with an even brilliance. The direct rays are broken up through deflection on the strips, but no light is lost in process.



The metal strips on this headlight bulb deflect the direct light rays, thereby reducing the glare.

Cosmic Ray Meter Will Wrest Secrets From Stratosphere

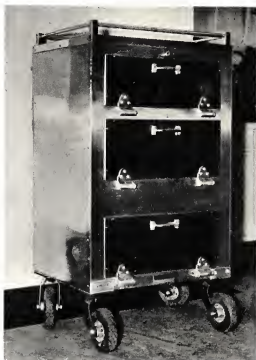


In an effort to wrest new secrets from the cosmic rays, this complicated meter, invented by Dr. Compton, left, and Dr. Doan, right, will be sent into the stratosphere on a balloon.

THE mysterious cosmic rays which have long baffled scientists, and whose origin is still unknown in spite of several daring stratosphere flights, are to be further investigated by a new apparatus invented by Dr. Arthur H. Compton of the University of Chicago, and his assistant, Dr. Richard L. Doan.

Dr. Compton, who is a Noble Prize winner, will send his apparatus aloft on a balloon, and when it has reached an altitude of 10 to 15 miles, it will transmit its findings by radio to ground station. Its chief objective will be the recording of the intensity of cosmic rays as they bombard the instruments. It will make its first ascent early this spring.

"Lunch Wagon" For White House



This is President Roosevelt's new lunch wagon. It is really an electrically heated "hot box" and food may be left in it for hours without cooling. Note the balloon sized wheels.

Scientists Perfect Arthritis Serum

ARTHRITIS and rheumatism, two of humanity's most common afflictions, are now believed to be under control as the result of a new serum developed by Dr. Samuel Stern of Atlantic City, N. J. and William Kurland, chemist.

In recent tests the serum has proved successful in 97 per cent of the 125 cases receiving the treatment, Dr. Stern declared. Dr. Stern is well known in medical circles for his specialized work in rheumatism and arthritis.



A new serum developed by Dr. Stern, left, and William Kurland, right, is expected to stop the ravages of arthritis and rheumatism. It has proved nearly 100 per cent successful.

A LUNCH wagon de luxe, encased in glittering metal and rolled upon balloon tired wheels, has been placed at the disposal of President Roosevelt. When the Chief Executive finds himself too busy to take time off for lunch, the lunch wagon is pushed in, and he is served a piping hot meal.

Modern Mechanic & Inventions

Heart Action Is Filmed With New X-ray Movie Camera

MEDICAL science has advanced another step in its war upon diseases of the heart with the development of a new machine, known as the "kymograph" which takes X-ray moving pictures of the heart.

Heart disease takes more lives than any other human ailment, and the new machine is expected to play a large part in reducing this toll. The patient stands quietly before the machine while the filming is in progress. The movie is then projected, greatly enlarged, upon a screen and the heart action can be studied by several doctors simultaneously. Dr. W. G. Scott and Dr. S. Moore of the Washington University School of Medicine invented the machine.

Light Is Polarized By New Glass

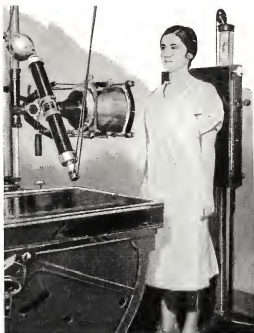


The glare of the headlight at the left is stopped by the "polaroid" windshield. This new type of glass is expected to reduce accidents at night. Circle—When used in mirrors the new glass imparts a third dimension effect by eliminating surface reflections.

THEORIES concerning the polarization of light have at last been taken out of the laboratory and put to work. The result is a new type of windshield and a new headlight lens which filter out the diffused rays of light, eliminating glare entirely and at the same time increasing visibility for night driving.

The glass consists of three sheets, two of which are of regular glass held together by a third sheet of plastic material containing the polarizing crystals. Vibrations caused by light striking upon the glass are diverted by the crystals and never reach eyes of driver.

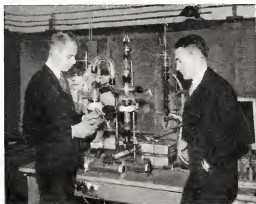
Magazine, April, 1936



This new machine takes X-ray moving pictures of the heart. When projected upon the screen, the pictures are greatly enlarged and the faintest sign of heart trouble is exposed.

Atomic Research Aided By Youth

RESearch in the field of nuclear disintegration has been greatly advanced by the contributions of Paul F. Darby, 21-year-old graduate assistant at Ohio State University. He is credited with producing strong narrow beams of negatively charged hydrogen atoms in a high vacuum. His research is expected to lead to new methods of disintegrating the atom without expensive equipment.



Only 21 years old, Paul Darby, left, has made several important contributions in the field of nuclear disintegration. He is shown discussing his apparatus with Dr. W. H. Bennett.

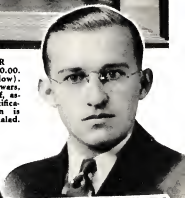
123 Win in Scrambled



FIRST PRIZE WINNER
A check for \$750.00 was sent to Gerald Damush (above) who correctly assembled and identified the scrambled photos and inserted each one in a niche of Hall of Fame (right).



THIRD PRIZE WINNER
Paul Kovacsik (right) won \$100.00. His entry was the book (below). The upper half contained answers, slogan, and name; lower half, assembled photos and identification. When barred screen is moved, drawing is revealed.



SECOND PRIZE WINNER
George A. Baschar (above) received \$300.00 for the simple but neat booklet shown above him. His slogan "A World of Ideas"—Ideas for a World" was a factor in the award.



\$1750.00

Photo CONTEST

GERALD DAMUSH, of Brooklyn, N. Y., was awarded first prize of \$750.00 in the Scrambled Photo \$1,750.00 cash prize contest that appeared in the November, December, and January issues of **MODERN MECHANIX & INVENTIONS MAGAZINE**. His entry was picked from among hundreds as the best on all points used as the basis of judging.

Second prize of \$300.00 in cash was awarded to George A. Beecher, of Marshalltown, Iowa. Third prize of \$100.00 in cash went to Paul Kovacsik, of Akron, Ohio. Winners of the remaining 120 cash prizes are listed in the next column.

Although contestants were not encouraged to submit elaborate entries, the Hall of Fame structure submitted by Mr. Damush showed considerable ingenuity. To be fair to all contestants and in order not to be influenced by such entries, the judges submitted the twenty

[Continued on page 142]

MODERN MECHANIX & INVENTIONS MAGAZINE

The Monthly Review of Human Ingenuity

"The Monthly Review of Human Ingenuity" was voted the best of all magazines submitted. It helped to bring \$750 first prize to Gerald Damush. The slogan is shown above as it appears under the title of the magazine.

Shortly after the New Year's holiday MM's office was swamped with hundreds of entries. Two tables covered with entries and three mail bags full are shown at right.



THE WINNERS

FIRST PRIZE \$750.00 CASH
Gerald Damush, Brooklyn, N. Y.

SECOND PRIZE \$300.00 CASH
George A. Beecher, Marshalltown, Iowa

THIRD PRIZE \$100.00 CASH
Paul Kovacsik, Akron, Ohio

TEN FOURTH PRIZES \$20.00 EACH

Emil J. Kleiman, Kenosha, Wis.	Raymond H. Badger, Chelsea, Mass.
D. E. Aldrich, Keokuk, Iowa	G. H. Pittner, Independence, Mo.
Annie E. Amos, Fort Wayne, Ind.	Milton Katsletsky, New York, N. Y.
Carville Hackman, Sparrow's Point, Md.	Julie C. Heinicke, Pontiac, Mich.
James H. McLean, Lakewood, B. I.	Edwin W. Logan, Logan, Iowa.

TEN FIFTH PRIZES \$10.00 EACH

Donald E. Van Denberg, Rockford, Ill.	Arthur W. Felt, Kansas City, Mo.
Jeanne Melanson, New Orleans, La.	Walter E. Johnson, Chicago, Ill.
Joseph R. Lukovics, Lorain, O.	Edmund Kutchers, Milwaukee, Wis.
George R. Wolcott, Scarsdale, N. Y.	William Thorson, Greeland, Pa.
Ken McCormick, Hempstead, N. Y.	Harvey A. Westley, Detroit, Mich.

50 SIXTH PRIZES \$5.00 EACH

Traver Thomas, Grosse Pointe Park, Mich.
J. S. Railback, Modesto, Cal.
James A. Wallace, San Francisco, Cal.
Z. H. Lane, Portland, Oregon
William Picha, De Soto, Mo.
Orlo Gerard, Oakley, Idaho
Frederick Minch, Bronx, New York City
Howard M. Clipp, Paterson, N. J.
George A. Moore, Hubbard, Ohio
William F. Burton, Akron, Ohio
Richard R. Hyman, Effingham, Ill.
B. Burrow, Bethany, W. Va.
John Edward Linahan, Syracuse, N. Y.
C. P. Engle, South Bend, Ind.
W. F. Druzak, Pittsburgh, Pa.

[Continued on page 142]

Mysteries of Cold Light Unraveled By Research Chemists



For the first time cold light such as is displayed by fireflies and glow worms is produced artificially by science. This chemi-luminescence demonstration was made in Chicago.

Table-Top Engineers Show Skill

DETAILS in model building such as most table-top engineers never dreamed of were revealed at the eighth annual exhibition of the New York Society of Model Engineers held recently in New York City. Center of attraction was a miniature railroad system complete with roundhouse, elevated lines, bridges, and every type of locomotive and car.



Built to exact scale in every respect, this model railroad proved to be the center of attraction at the model engineer's exhibition in New York. Note the elaborateness of the details.

LIGHT without heat, dropping and splashing in a brilliant stream, has at last been produced by science after years of research. In a demonstration performed by Carl W. Zersen at the Chicago Lighting Institute, certain chemicals, known as chemi-luminescence, were poured in liquid form into a jar, producing enough light for photography.

For years scientists have puzzled over the source of the cold light emitted by fireflies and glow worms, but never have been able to duplicate it artificially. They believe that in cold light lies the secret of domestic and industrial illumination. Incandescent lamps operating at their peak of efficiency waste 92 per cent of their energy in heat.

Windmill Dispels Dangerous Frosts



By making 950 revolutions per minute, this giant air circulator prevented 40 acres of oranges from freezing during a California cold snap. Government officials are interested.

A WINDMILL, not for turning wind into power but power into wind, has proven successful in protecting a 40-acre orange grove from frost. The giant air circulator, installed on ranch of J. E. Bowersmith, Whittier, Cal., draws down the warm air from above grove, sending it whirling through trees. Frost cannot settle where air is circulating.

Modern Mechanix & Inventions

Metal Replaces Glass In Radio Tube Construction



First operation in making the tube is the stamping of the header which serves as foundation of tube. Glass-beaded eyelets are next fused in header following which the tube's elements are inserted and welded fast. Last the air is pumped from the tube. Tube construction is shown in center while at right the metal tube compared with a transmitting type.

CONSTRUCTING radio tubes in metal instead of the familiar glass envelopes is the latest step made by science in improving radio broadcast reception. Through the use of a new metal alloy known as "Fernico" welds can be made to the various tube elements in 1/30 of one second. After tube has been assembled special pumps draw all the air from the tube after which it is sealed with another weld, requiring only a split second. Through the use of the metal envelope the metal tube shields are no longer required. Not only does this save space, but it at the same time greatly improves results attained with short wave and all-wave receivers. A feature of the metal tube is that they, unlike their predecessors, are practically unbreakable if dropped accidentally.

Sub-Stratosphere Plane To Cross Atlantic In 12 Hours

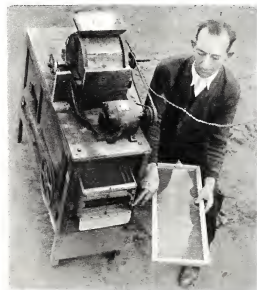


This the the new Crusader which is expected to fly the Atlantic in less than 12 hours. It has a cruising speed of 300 miles per hour at an altitude of 26,000 feet. Note the tear-drop lines of the tailless cabin.

Tiny Thresher Sorts Flower Seeds

A MIDGET threshing machine weighing but 50 pounds has been designed by a California gardener to thresh his flower and vegetable seeds. It operates on the same principle as the big farm machines.

Using a $\frac{1}{4}$ -horsepower electric motor, the little machine can do the work of several men. Seed pods are fed through a hopper into a mangle which separates seeds from the husks. The husks are blown out by fans while the seeds drop onto a series of vibrating mesh screen and are sorted for size. The screens are interchangeable, and any size mesh may be used.



This vest-pocket edition of the huge grain threshing machines was invented by a Californian to thresh his vegetable and flower seeds. Vibrating screens grade the seeds for size.

A MERICA'S latest bid for honors in the international race for speedier commercial airplanes is the sub-stratosphere Crusader recently demonstrated at Miami, Fla. With speed streamlined into every inch of her metal frame, the new plane is expected to make the flight from New York to Paris in less than 12 hours.

The Crusader was designed by Thomas M. Shelton for a cruising speed of 300 miles an hour at an altitude of 26,000 feet. The plane is thoroughly insulated against changes of temperature, and in rarified atmosphere air will be supplied the passengers from special oxygen tanks. Twin motors supply the power.

Electric Telescope Penetrates Fog



This electric telescope can see in the dark by means of infra-red rays that are electrically treated.

AN electronic eye of super-penetrating power has been invented by Dr. V. K. Zworykin of R. C. A. Objects made invisible by fog, or darkness are readily discernible with the electric telescope. Infra-red rays treated chemically and electrically make vision possible.

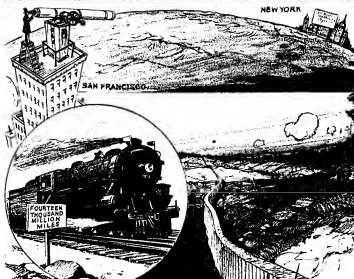
Sense Of Smell Reveals Tumors

DR. CHARLES A. ELSBERG of the Neurological Institute of New York is credited with the discovery of a new device which measures a patient's reaction to smell. The scent of lemon or coffee is sprayed through the nostrils to the olfactory nerve. Certain types of reaction indicate the presence of brain tumor detectable in no other way.



This new "tumor detector" measures a patient's reaction to smell. Certain abnormal reactions indicate the presence of brain tumors.

War Costs Build Front Line Of Silver Nic Sprank Offers \$5 for Best Oddity



YOU COULD READ A SIGN CLEAR ACROSS THE CONTINENT WITH THE 200 INCH TELESCOPE! When completed by the California Institute of Technology it will be 640,000 times as far-sighted as the human eye. It is expected to find 100,000 new universes. —

Thomas Keim, North Evans, N.Y.

AMERICAN FREIGHT TRAINS TRAVEL 14,000,000,000 MILES ANNUALLY! — This means that if one man were to do all the travelling he would whip his train around the earth at the equator once every 15 minutes for a year, without stopping for meals.

Kenneth Potter, Wauconda, Ill.



Robert Whiteley, Forty Fort, Pa.

Five dollars will be paid for the Oddity used by Nic Sprank as his central illustration. One dollar will be paid for all others used on this page. Send your Oddity to Nic Sprank, Modern Mechanix Publishing Company, Fawcett Bldg., Greenwich, Conn. Source or proof of each Oddity must be given. Send all Oddities separately, not with other manuscripts or letters.

Behind *the* Scenes with

by JAMES DYSON

A FLOURISH of trumpets and the announcement "March of Time", coming through the loudspeaker at your local movie theater, represents the introduction of a new kind of motion picture journalism—dramatized news pictorially presented to impress you with the importance of current events.

Like the fast moving drama of its daily radio news presentation and the vivid stories of its companion magazine, March of Time on the screen has won public favor because it combines the striking events of the present with the unusual background so often forgotten in the hustle of the average newspaper editorial rooms. A clever harmony of realism and illusion swiftly flashed on the screen indelibly stamps on the minds of the spectators the historic importance or the social or economic significance of the story being unfolded before them.

The making of this new type of newsreel is a captivating story of originality put to work. The ingenuity of the inventor, the trick lighting and angles of the expert photogra-



Unusual angle of line-man scene impresses audience with message that modern conveniences are coming to Tennessee Valley inhabitants.



Above—March of Time cameramen may be rushed anywhere to get important scenes. Three weeks were spent on Florida shores to pre-empt inaugural flight of Clippers across the Pacific. Left—Camera crew "on location."

the MARCH of TIME



Left to right—John S. Martin, editor of *March of Time*, Roy E. Larsen, president, and Louis de Rochemont, production chief, preview a release.

pher, the realistic portrayal of actions and voices of personalities by the prominent persons themselves in the role of amateur actors or by professional character actors, and the audacity of the fearless news reporter all play a part with the psychological importance of sound to convert the ordinary newsreel scene into a story that will not be forgotten.

March of Time's camera crews, stationed in important centers of the world, are ready to dash to an unfolding news story and catch real life scenes. But when circumstances make this impossible, the technique of re-enactment is employed. The completed film is a judicious blend of old and new pictures, real voices and actors, actual scenes and re-enacted scenes, harmonized with true sound effects, the voices of the narrators, and super-imposed sound.

The task of supervising the production of each release, which comes out once a month, is in the hands of three men—Roy E. Larsen, president of the March of Time Corporation; John S. Martin, vice president and editor, and Louise de Rochemont, production chief. These are the men who cull from the news events of the month the happenings that are significantly important to the present



At great expense *March of Time* cameramen bring relatively short scenes from far-off lands to complete story for the screen. Above scene shows bend of volunteers saluting the American flag as it flies in mid-Pacific on Jervis island, landing station on the new trans-ocean airline.

and future life of the motion picture public.

It is the task of these men to see that each sequence has some bearing on a news story of national significance and that it is treated intimately. Instead of the short unrelated scenes of the usual newsreel, each sequence must have a definite beginning, a middle, and an end—it must be a complete story in itself.

If necessary the *March of Time* will go to

Cameraman Becomes Peddler To Get Rare Scenes

considerable expense and call upon the greatest ingenuity of the cameraman for a scene needed to complete a story. It would have paid a good sum for a few intimate close-up shots of Sir Basil Zaharoff, the mysterious European munitions king, at the time the editors were working on a story of the munitions industry. As none was available, a March of Time cameraman was sent from Paris to the Riviera to obtain the snaps.

The cameraman was well aware of the difficulties facing him, for the 85-year-old Zaharoff is surrounded by a seemingly impenetrable bodyguard to ward off photographers and reporters. By posing as a taxi driver with a camera concealed in his cab, the March of Time cameraman obtained several excellent shots of the munitions mag-



If necessary, the cameraman changes costumes to suit the occasion. Here is a photographer, Burt Pika, in formal clothes to shoot scenes at the opera. Another photographer became a pushcart peddler to get by bodyguard for scenes of Sir Basil Zaharoff, munitions magnate of Europe.

nate descending his hotel steps and being assisted into his Rolls-Royce. The same cameraman also got a job as a pushcart peddler of refreshments at a railroad station from which Zaharoff was to depart. When Sir Basil appeared in a wheel chair, the cameraman pushed his cart by, impertinently offering his

[Continued on page 136]



Above—Every scene is carefully edited in the laboratories where pictures, sound effects, narration are combined. Right—This picture was not made in Manila. It is a set in Miami, Fla., for reenactment of trans-Pacific flight.



Lure of Sea Draws Thousands To See Craft At Boat Show



Left, above—After being lost for four hours in the fog, this 45-foot cruiser made its way to the dock and was hoisted aboard a truck. Above—New York streets were filled with motorboats cruising to the show. Here's one on Lexington ave.

Left—A general view of the National Motorboat Show in New York's Grand Central Palace. More than \$2,000,000 in boats and accessories were shown. Above—This was the smallest boat at the show, a six-foot sail boat for sheltered water.

AMERICA has become boat conscious. The lure of the blue waterways was plainly evident as record breaking crowds visited the National Motor Boat Show at the Grand Central Palace in New York City to see the latest in things that float.

Streamlining dominated in boat design again this year. From morning until night crowds swarmed about a 56-foot, 26-ton yacht, the largest boat at the show, and similar crowds showed as much interest in a neat 6-foot sail boat, the smallest boat exhibited. Another attraction was a paddle wheel scooter as a summer resort novelty.

More than 100 boats of all types; from speed boats capable of 65 miles per hour to electric outboard motor boats capable of but 3 miles per hour, made up the \$2,000,000 exhibit.

Magazine, April, 1936

Engineers Test New Tank Car

ENGINEERS are watching with interest the tests now being made to determine the superiority of streamlined tank cars over the conventional models. The first of the 6000-gallon capacity streamlined tank cars has been placed in service by the Borden's Farm Products Company hauling milk into New York City.



Some idea of what the tank cars of the future may be like is given by this streamlined car now being used to haul milk into New York City. It is the first streamlined tank car.

MAKING A PARADISE

by RICHARD H. PARKE



This wire hair terrier can have harness and jacket in colors to match his mistress' clothes.

ONLY a few years ago a dog was just a "pooch" that ate the scraps from his master's table, ran carefree on farm or streets, and slept in a soap box kennel through fair weather or foul. Today he has become "His Majesty, the Dog," as pampered as a debutante.

If you live in the larger cities, your dog's life can become a paradise. He has his own beauty parlors, pent houses, and ambulances. He can have a special attendant take him strolling. Well-balanced meals are brought to him by a uniformed waiter. He can have specialized toys kept in a toy chest resembling a fire hydrant.

Why these increasing services for dogs? Because modern life makes them necessary in American cities. The dog cannot run free without endangering his life under the wheels of automobiles. To make up for his lack of exercise his food must be balanced properly and his coat groomed. Then, too, the pedigree dog has replaced the "pooch." The more valuable the animal, the more care he will receive from his master.

The services offered dog lovers cover a wide range. One of the most important is the meal service furnished by a concern on New York's upper East Side. For a fixed monthly fee, the pets are provided with daily meals, delivered three times a week. The meals packed in attractive containers, are carried about the city in smart, white trucks and are brought direct to the home by uniformed messengers.

The menus vary slightly with the type of

The "pooch" has become the King! He can have his nails manicured and his specially-prepared meals brought to him by messenger. In New York a hotel maintains pent house "apartments" for him. Here are some of the specialized services for your dog.

dog but all are scientifically balanced. A typical meal includes fresh lean beef, either raw or cooked, cubed or ground; vegetable vitamin juices in beef broth, shredded cabbage or lettuce and special breakfast food. An a la carte menu also is furnished and the pet owner may order any of the following: Beef hearts, beef liver, beef kidneys, beef head meat, lamb, lamb hearts, tripe and tongue. There are also such "beverages" as cod liver oil, "limed" milk, goat's milk and sour milk.

Another popular service for dogs is the weekly or monthly flea inspection, washing and grooming. This includes such beauty treatments as eyebrow plucking, manicuring



Here is the Puppy Club atop the roof of a New York hotel where dogs of guests have their own pens. Each dog is given a medical inspection before it is admitted to the club.

OF YOUR DOG'S LIFE

and teeth cleaning. The pet owner arranges on what days he wishes his dog called for, and these are marked off on the shop's calendar. The time arrives, the dog is taken from the home, the service is performed and the animal is then returned.

Different breeds require different care and the men handling them are experts, employing scientific devices to accomplish their tasks.

The variety of brushes and combs used in grooming would do credit to any barber shop. There is the wire fibre brush for Great Danes, Cockers, Wirehaired Terriers, Shepherds and Bulldogs; the white bristle brush for Poms, Pokes and Toy dogs; the slanting bristle brush for stubborn, wiry or thick coats and the penumatic wire brush for Chows and Kerries.

Professional dog walkers, who will prome-

[Continued on page 130]



At left is a complete dog grooming kit, containing brush, nail, file, scissors, towel, first aid kit, flea soap, rubber bone end ball.



One of the many services available for your dog is the "dog walking" attendant shown above. He will call at your apartment at specified hours to take your pet out for a stroll. The charge is 25 or 50 cents.

At meal times the midget truck at left will call at your home and deliver your dog's meals. They will be scientifically balanced and will contain the proper vitamins. If the dog is ill, meals are prepared according to veterinary's orders.



AMATEUR PHOTO PUZZLERS

Your Camera Problems Answered



The growing popularity of amateur photography and the increasing number of letters on this subject from readers led to establishment of this department. Is it the Photography Editor will answer any question or problem related to cameras of all types, enlarging, printing, developing, taking pictures, and the various phases of home movie making. When sending questions to this department, be sure to include a stamped, addressed envelope in case space does not permit publication of the question and reply on this page. Send all inquiries to the Photography Editor, Modern Mechanix & Inventions Magazine, Greenwich, Conn.

TAKING PICTURES INDOORS

I know Super Sensitive Panchromatic film gives best results when taking pictures indoors at night, but the other night, because I still had two shots left on a roll of Verichrome, I tried it at f.6.3, shutter 1/25, with two Photofloods. Results were very poor. Can you give me correct data and light set-up for using Verichrome indoors at night?—O. S. H.

While Verichrome film is not noticeably slower than Super Sensitive Panchromatic film by average daylight at noon, it will require at least twice as long an exposure by tungsten light. Therefore, when using the two Photoflood bulbs in a Kodaflector or equally good reflector within four feet of the subject, the exposure should have been about 1/10 on Verichrome. Or, an exposure of 1/25 could have been given at stop f.4.5.

PREVENTING GRAIN IN ENLARGEMENTS

I have a number of small negatives, developed by a photo-finisher, which I wish to enlarge but the grain is very coarse. Is there any method of removing or minimizing the grainy appearance without losing detail?—R. S. B.

The coarse grain of negatives may be somewhat minimized when enlarging by placing a small pool of glycerine on the lower plain glass of the enlarger. Place the negative on this pool of glycerine and press it down so that there are no air bells. Then cover the negative with another pool of glycerine and place the upper glass over it. "Prevention is better than cure," however, and it is much more satisfactory to use a fine grain film and a fine grain developer so as to prevent getting grainy negatives.

WHEN FILMS ARE FREE OF HYPO

How can you tell when films are entirely free from hypo?—A. R. G.

This formula may be used to test for hypo:

	Avoirdupois	Metric
Potassium permanganate	4 grains	0.3 grams
Sodium hydroxide (caustic soda)	8 grains	0.6 grams
Water (distilled) to make	8 ounces	250.0 cc.

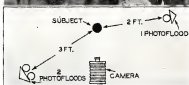
If three or four drops of this stock solution are added to a test tube or small graduate, partly filled with water, the color will be pink or violet. Now remove the roll of film from the wash water and hold it up so that it will drain into this test tube or graduate. If hypo is present, the pink or violet color will turn to orange within about 30 seconds. If no hypo is present, the pink or violet color will remain.

CAUSES OF STREAKS IN PHOTOS

What are the principal causes of light streaks?

Is there any way of telling from the character of the streaks whether there is a leak in the bellows or in the camera, or whether the film was light struck during developing?—J. R. N.

If there is a uniform veil of fog over the film, the film was probably handled in a room where the light was not quite safe at the time of development, or the safelight may not have been safe, or the film may have been held too close to a safelight lamp for examination. If dark streaks come in from the very edge of the film, the trouble may be due to the back not fitting on the camera properly or to the film becoming loosened on the spool outside the camera. If there are irregular dark streaks, the difficulty is likely due to a leak in the bellows or some part of the camera.



Side-lighting produced this fine portrait. One photoflood is sufficient to light up shadows, two to bring out highlights. On Verichrome film a 1/10-second exposure is necessary at f. 6.3, or 1/25-second at f. 4.5 opening.

French Helicopter Makes Successful Vertical Flight

AT VILLACOUBLAY flying field in France one of the first helicopters to successfully leave the ground is being tested. On its first flight the machine rose vertically over the heads of the spectators, and then, without warning, the rotating vanes locked. To the surprise of the spectators, the queer ship descended slowly without injury to pilot or craft.

Though efforts have been made for years to build a helicopter, none have been successful, the main difficulty being that of power. It takes one horse-power to lift 15 pounds vertically, with the result that a craft weighing several hundred pounds is almost impossible to raise. The inventors are still hopeful, however.



This helicopter at Villacoublay flying field, France, made aviation history by making a vertical flight. Its inventors are now working to further perfect it, and expect to have it back in the air again in the near future.

Mechanical Hand Retrieves Balls

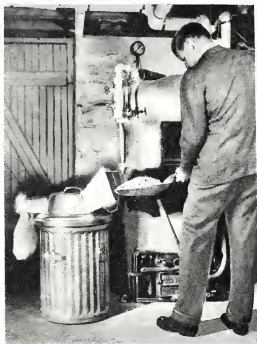
This golf ball retriever makes light work of removing the balls from the putting cup, and is especially handy when there is a half-inch of water at the bottom. In addition to retrieving the balls, serves to keep flag in upright position.



A NEW mechanical hand for retrieving golf balls from the putting cup is built into the base of the flag pole. When the putting has been completed, the retriever is placed in the cup where it readily picks up as many as four balls. Women, especially, favor the device.

Dustless Ash Can Has Suction Fan

THE clouds of dust raised by the removal of coal ashes from the furnace is eliminated by a new device which operates on the principle of the vacuum cleaner. It consists of a metal hood fitting over the top of any standard ash can and a small electric suction fan. The front opening, into which the shovelful of ashes is inserted, is closed by a curtain. Dust is sucked into a bag.



This is the dustless ash remover. As the ashes are shoveled through the opening, a suction fan draws off the dust like a vacuum cleaner, depositing it in the canvas bag at the rear.

What New INVENTIONS

RULES

1. In 100 words or less explain your idea for a needed invention.
2. This contest is open to everyone except employees of Modern Mechanix Publishing Co., and members of their families.
3. You don't have to buy a copy of this magazine or be a subscriber to enter the contest.
4. Write your name and address plainly on your entry. No entries will be returned.
5. The editors of this magazine will be the judges. Their decisions are final.
6. Mail your entry to Inventions Contest Editor, Modern Mechanix Publishing Co., Greenwich, Conn. Entries for this month's contest must be postmarked on or before April 1, 1936.

\$50.00

Cash Awards

SMALL fortunes have been made by inventors who have successfully solved the problems mentioned each month in the Needed Inventions department of this magazine. Now MM has decided to give its other readers an opportunity each month to win money by supplying the ideas for the inventions.

MODERN MECHANIX AND INVENTIONS MAGAZINE will award \$50.00 in cash for the best suggestions for needed inventions. First prize will be \$25.00 and nine other cash prizes listed in another column will be awarded every month. The closing date will be the first of the month of the date of the issue. The contest for this, the April issue, therefore will close April 1. Inventions are needed in every



Illustrated on these two pages are a number of needed inventions that might have won prizes if the ideas had been submitted in this contest. Sketches can be included with entries to clarify ideas, but are not necessary. Watch your daily tasks to discover ideas for contest. All devices illustrated are simple.

A VISIBLE INDICATING DEVICE THAT WILL SHOW WHEN FIREARMS ARE LOADED



A SIMPLE CIGARETTE DISPENSER PACKAGE

AUTOMATIC LETTER ENVELOPE INSERTING MACHINE

Does The World NEED?

TEN PRIZES FOR BEST IDEAS

PRIZES:

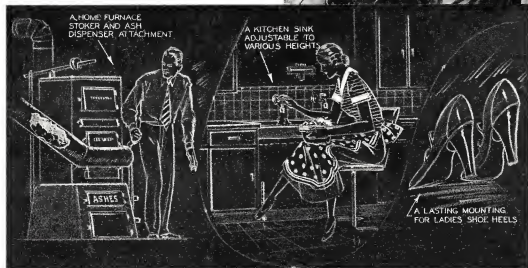
FIRST PRIZE	\$25.00 IN CASH
SECOND PRIZE	10.00 IN CASH
THIRD PRIZE	5.00 IN CASH
THREE FOURTH PRIZES	2.00 EACH
FOUR FIFTH PRIZES	1.00 EACH
TOTAL—10 PRIZES	50.00 IN CASH

home, in every office, in every factory, on every farm. You can find ideas all around you. As you go through your day's tasks simply note how they might be lessened if you had some simple device. Those words, "simple device," are the key to winning prizes in this contest. It is the simple needed inventions that MM wants to pass on to its inventor-readers because the simple idea is the germ that leads to bigger things. The automobile, for instance, was not invented at once. The modern automobile is an assembly of many inventions, and new inventions to improve it are being patented every day.

From the inventor's standpoint, too, the simpler device is easier to sell either to manufacturers or to wholesale distributors because such devices can be disposed of at low prices and produced at small costs.

You don't have to be an inventor or even a

[Continued on page 124]



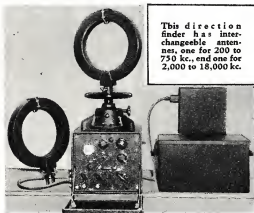
Air Mattress Dons Wings To Become Emergency Glider



This rubberized fabric glider can be folded into a space no larger than a trunk, and can be pumped up by hand in 15 minutes. It can be flown as easily as a conventional glider.

New Direction Finder Is Portable

A NEW Coast Guard portable direction finder, the first model of its kind, can be used at sea in a boat, in the air, or on land in a car or truck. It is designed for use in rescue cooperation work in locating grounded airplanes or ships lost at sea, and in criminal detection work. Signals can be accurately followed with the finder for more than 500 miles. It has interchangeable loop antennas and its own power plant, complete with batteries and recharging box.



This direction finder has interchangeable antennas, one for 200 to 750 kc., and one for 2,000 to 18,000 kc.

TAKING his cue from the inflated canvas life boats with which many ocean liners are equipped, a Russian inventor has produced a rubberized fabric glider for air liners. While not intended to replace parachutes, it is pointed out that the collapsible glider can be stored in a minimum of space in a large dirigible, and launched through an opening in the hull when necessary.

When deflated, the glider occupies no more space than a trunk, and weighs but 93 pounds. It can be pumped up in less than 15 minutes with an ordinary hand pump, and when inflated becomes an amphibian glider 20 ft. long, with wing spread of 24 ft. In the air the craft is as easy to handle as a conventional glider.

Device Dries Wash In 3 Minutes



This electrical clothes drier has a rotating cylinder in which the family laundry can be rough dried by centrifugal force in 3 minutes. It seves wear and tear on the clothes.

AN ELECTRICAL clothes drier using centrifugal force is capable of rough drying the family laundry in three minutes. The dryer plugs in on any light circuit, and is small enough to fit in any out-of-the-way corner.

The clothes to be dried are suspended by a net inside a rotating cylinder. As the rotation casts the water off, air currents are drawn through the clothes to hasten the process through evaporation. A waste pipe draws off the excess water. The dryer is much easier on clothes than wringing, as well as being much faster. It was developed in Germany.

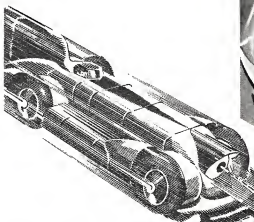
Modern Mechanic & Inventions

LIGHT BEAMS Steer SUPER RACING CARS

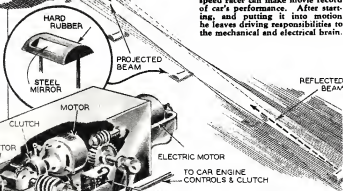
Speeds never before attained on land may become a reality if experiments with light beam, driverless cars are successful. Here are the mechanical features that will be involved.



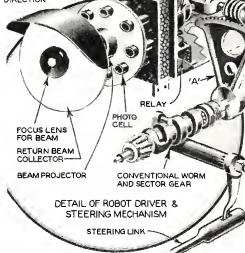
The driver of the proposed super-speed racer can make movie record of car's performance. After starting, and putting it into motion he leaves driving responsibilities to the mechanical and electrical brain.



Above, the method of reflecting the light beam is clearly shown with the steel mirror inset in road is shown in the circle. The mechanical-electrical brain's operation is pictured below. If the car goes to the right, the electric eyes on the left side of the multiple eye pick up the beams and set the relays which operate the steering mechanism. The car then swings back until it is centered.



RELAYS OPERATE MOTORS AND CLUTCHES TO ROTATE STEERING WORM IN EITHER DIRECTION



WITH speeds, such as recently attained by the famous Sir Malcom Campbell, already approaching the point where human reflexes are too slow to insure safe control of the car, science has turned to the photo electric cell for a possible solution. A proposed driverless car involves the use of multiple electric eyes as the heart of its steering mechanism. A powerful beam of light directed at a large lens on the front of the car is concentrated on steel mirrors set at an angle in the trackbed. The reflections are "caught" by the electric eyes which convey the electrical impulses to a mechanical-electrical brain which keeps the speeding car on its course.

The use of the electric eye for this purpose is not surprising as German railway engineers have been operating trains on the Reichsbahnzentralamt of Munich in this manner for several years. Here a spotlight is mounted on the locomotive so that it throws a beam upward to a mirror on the trackbed. When the signal is red the mirror reflects the beam to photo electric cells on the locomotive which automatically set the brakes. This method was described in the *Modern Mechanix* for November, 1934.

Bullets from Same Gun Linked By Camera



The two bullets at the rear of this comparison camera make one composite bullet, as shown in the above photo.

PHOTOGRAPHIC evidence as to whether or not two bullets were fired from same gun is irrefutably supplied by a new comparison camera invented by Dr. J. H. Mathews, University of Wisconsin professor and criminologist.

The camera marks a sensational advance of science in the war against crime. By taking pictures of opposite sections of the two bullets being checked, the camera reconstructs a composite bullet of the two sections. The resulting photographic reproduction is enlarged between 64 and 256 times the size of the bullets, permitting positive identification before a courtroom jury.

The camera is really two cameras merging into one at the single plate holder. The bottom camera takes a photo of the base of one bullet while the upper camera registers the top section of the second bullet, the two halves appearing on the print as one.

Remote Scale Gets Weight By Wire

NOT always can a large weighing room be installed in the records department, and to eliminate the time wasted between the scales and the office, one manufacturer has produced a remote indicator which registers in the office the weight of the material being checked at some distant point in the factory or yards.

By accurate synchronization the dials on the scale head and the remote head are always the same.



This is the first scale to transmit weight over wires. The young lady is weighed on this scale, but the result is registered on a remote head which returns the figure by wire.

Folding Bike Fits Traveling Case



This folding bicycle can be conveniently carried by train or auto to some country spot where the rider can begin his tour of exploration in a fresh condition.

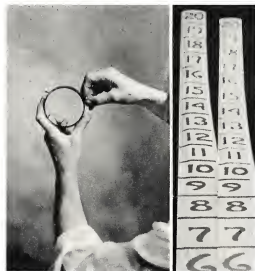
EUROPEAN bicycling clubs are looking with approval upon a collapsible bicycle which can be folded into a bag the size of a suit case. One of its biggest advantages is that in its folded state it can be carried by train or auto to some scenic section, there to be reassembled and the rest of the tour completed in leisurely fashion upon the machine. When unfolded, the bicycle is every bit as sturdy as the conventional model. The wheels are smaller than average to facilitate handling, and the handlebars are mounted on a removable extension.

New Color Photography Process Found By Conductor

ARTHUR RODZINSKI, famous conductor of the Cleveland Symphony Orchestra has found in photography still another artistic outlet. Not content with ordinary amateur work, Mr. Rodzinski has concentrated on color photography with the result that he has evolved an entirely new process.

The same reticence, however, which prompts musicians to practice behind closed doors has led Mr. Rodzinski to keep his method a secret until it has been further perfected. While admitting that it was a chemical process hitherto unknown, the conductor would not reveal the formula.

Extra Camera Lens Doubles Speed



This auxiliary lens doubles both depth of focus and speed of any camera. The same camera took both photos of the 20-foot strip of paper shown above. The photo at left was taken with the new lens; blurred photo with ordinary lens.

AN AUXILIARY lens, made in various sizes to fit any camera, doubles the depth of focus and at the same time doubles the speed of the camera lens. Realizing that only half of an ordinary lens was useful because of the presence of rays of aberration, Howard D. Beach, the inventor, devised a lens in which these "contrary" rays were eliminated. This was accomplished by a new principle in optics in which new optical curvatures compensate for the deficiencies of spherically ground lenses. The "contrary" rays being dispelled, the depth of focus is increased, and the speed of the lens becomes greater.

Magazine, April, 1936



While not wielding a baton before the Cleveland Symphony Orchestra, Arthur Rodzinski, conductor, is in his photographic laboratory, perfecting an entirely new color process.

Off-Center Wheel Drives New Bike

AN OFF-CENTER wheel, usually to be dreaded, is the secret of a radically new bicycle which operates without any pedals. To start the novel machine, which resembles a grown-up scooter, it is given a slight push with the foot, just enough to turn the rear, off-center drive wheel. The springy riding platform is attached to the rear wheel, and as it is carried rhythmically up and down by the off-center axle, the rider bears down with his weight on the down stroke. This method of propulsion will carry the machine anywhere a bicycle will go.

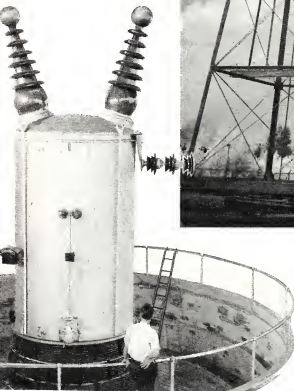


No pedals are needed on this new bicycle. The rear drive wheel is off center, and as it raises the platform up and down, the rider rhythmically bears down on the down stroke.

Like a scene from Mars is this weird infra-red photo of two giant transformers mounted on special tile foundations. These transformers, together with a third indoors, form a power frequency test set which can duplicate power line discharges. The two copper spheres are voltmeters. A calibrated cable, attached to the top one, measures the distance between the separate spheres.



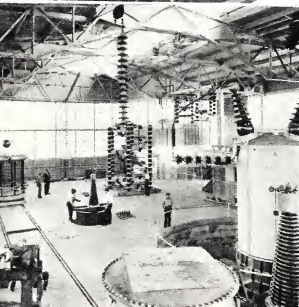
Here is the third transformer of the power frequency test set. It is housed indoors in a special well shaped to correspond roughly to that of the electrical field surrounding the transformer when in operation.



IN ALL the history of crime, no single crook has ever had the distinction of causing a costly laboratory to be built for the purpose of pursuing and trapping him. However, there recently was completed at Barberton, Ohio, an electrical Scotland Yard dedicated to the photographing, fingerprinting and reconstructing the Public Enemy No. 1 of the Power Industry.

This power enemy, whose criminal activities have crackled destruction in a thousand ways, is lightning. The institution that is expected to contribute much to its eventual downfall is the new electrical laboratory of the Ohio Brass Company. The company manufactures, at its Barberton plant, porcelain insulators used on power transmission lines, at radio stations, and in various other places where current-carrying equipment must be isolated electrically from such things as transmission towers.

The business of shooting electricity about



An interior view of the thunder-bolt factory. Here canned lightning is put through its paces by electrical engineers.



Science Stalks Power Enemy No. 1

by
WALTER E. BURTON

the country on wires would be much simplified if there were no thunderstorms. Lightning has a distressing and often expensive habit of striking power lines and interrupting service. The insulating equipment generally bears the brunt of these electrical attacks. While much progress has been made in past years in reducing such interruptions, engineers still have much to learn about natural lightning. That is why they build lightning factories where they can manufacture artificial thunderbolts at will, and watch their actions.

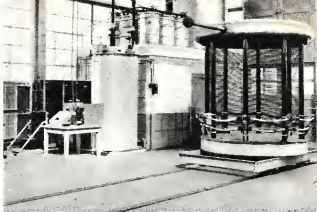
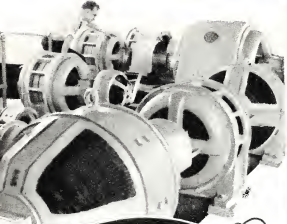
The visitor, entering the laboratory for the first time, scarcely knows what to inspect first. There are so many fascinating and imposing objects. One of the oddest is a complicated maze of shiny porcelain insulators, rectangular metallic boxes that form a helix running top to bottom among the insulators, numerous copper balls about as large as grapefruit, and lengths of heavy copper wires or rods.

Spectacular lightning displays flash from this high frequency generator, which has an output of 750,000 volts at frequencies up to 80,000 cycles. This lightning machine, based on the Tesla coil principle, is used to produce static electricity for special high-frequency testing.

This machine, which is standing inside the building, within an area enclosed by wire netting, generates artificial lightning flashes which, to the engineers, are known as impulse or surge discharges. It is capable of producing 3,000,000-volt flashes which will leap 15 feet, and which approximate, in all respects except that of size, natural lightning.

The framework of insulators that make up the queer-looking lightning machine are mainly for the purpose of supporting the metal boxes or capacitors. These boxes contain metal-foil-and-paper electrostatic condensers, much like those used in connection with automobile spark coils, radio equipment and other electrical machines for storing electric charges. They are forms of the Leyden jar, familiar to everyone who has taken a high school physics course. The box-shaped condensers are filled with an insulating oil.

Over at one side of the laboratory, outside the wire mesh safety fence whose job is to keep artificial thunderbolts from striking spectators and equipment, is a battery of motor generators. There are generators of all sizes, from little machines not much larger



Left, above—Here are a few of the motor-generator units which supply the laboratory with current. Above—The high-frequency generator together with some of the equipment needed in its operation. The generator is mounted on wheels for convenience.



A close-up of the towering transformers used in power frequency testing. Their use makes possible the testing of insulating equipment under regular voltage conditions such as are encountered on transmission lines. An infra-red photo.

LIGHTNING TAMERS

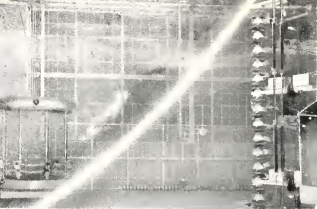
but by sparks that leap between the copper balls distributed, like Christmas tree decorations, over the lightning machine. The sparks form paths over which the condenser charges escape. The end product is an electric arc, which bombards an insulator or other object being tested. The entire operation of producing one of these artificial thunderbolts is automatic. All the operator has to do is throw a switch. The lightning machine then will proceed to manufacture a giant arc every 15 or 20 seconds, until it is turned off.

The cage-like lightning generator has a removable upper section, so that a part of the series of condenser boxes can be cut out of the circuit. For normal testing indoors, discharges at less than 2,000,000 volts potential are employed. Whenever it is desired to employ higher voltages, the machine, which is mounted on wheels that run over steel rails, is moved to one side of the building; and the upper section, which adds another million volts to the capacity, dropped into place. The generator then is wheeled out into the laboratory yard, where there is room and equipment enough for handling 3,000,000 or more volts. Although the lightning machine has a maximum capacity of about 3,000,000 volts, it can be enlarged simply by adding other condenser sections at the top. With this machine, discharges having a current intensity of 100,000 amperes, at a voltage of 150,000, can be produced. With such tremendous

than a table-top radio to ones that tower as high as a man. And the smallest of these motor generators operates the huge machine!

Current from the motor generator passes through a transformer which steps it up to 150,000 volts. This is fed through vacuum rectifying tubes which change it into direct current and pass it on to the plates of the condensers. The condensers are connected in parallel, like the lamp bulbs on an ordinary house lighting circuit, while being charged; but when they are discharged they are connected in series.

The switching from parallel to series is accomplished, not by mechanical switches,



Artificial lightning flashes, called "surge discharges," instantly vaporize this nichroma wire. Only a super-camera could catch this action. Right-Testing some of the meters and electrical equipment that are necessary for use in the lightning laboratory.



CAGE WILD ELECTRICITY

current, wires and other metal objects can be subjected to such intense heat that they are vaporized instantly.

Because the artificial lightning discharges take place so quickly that the human eye could not possibly see all that is happening, even if it were not for the intensity of the light, it is necessary to make photographs of the flashes. For this, a synchronized camera is used. Built into the automatic control system are instruments that trip the camera shutter at the correct instant. The shutter operates at 1/50th second, fast enough to permit daylight exposures without overexposure which might result in reversal of the lightning image, with consequent production of a "black lightning" picture. This reversal is a well-known photographic phenomenon caused by the action of intense light on a film that has been fogged previously by light.

But the automatic camera, when compared with the cathode-ray oscillograph, is slower than the well-known snail. The oscillograph is the instrument employed for photographing the electric wave involved in the artificial lightning flash—for fingerprinting lightning, in effect. Whereas the synchronized camera photographs the flash itself, the oscillograph makes photographic records of electric waves passing through it. The cathode-ray tube employed is similar to that used in television machines, but is much more speedy in its action. The ray itself vibrates back and forth in unison with the



Current for the generators pass into these transformers where it is stepped up to 150,000 volts. It becomes direct current in the vacuum rectifying tubes and is passed to condensers.

shifting of the current between positive and negative. In the ordinary house current, such as you probably use to illuminate your home, the shifting takes place 60 times a second. Farm-lighting plants sometimes use a frequency of 25 cycles instead of 60. But, in the artificial lightning machine, the complete dance of the electric wave may be over in one-millionth of a second!

For a long time engineers were baffled by the problem of trying to photograph the impulse wave used to make artificial lightning. It is necessary that the oscillograph operate at precisely the instant that the discharge

THUNDERBOLTS Reveal SECRETS for SUPER-CAMERA



A tragedy in miniature. With the white masses in the above photos representing clouds, the photo at left catches a "cloud to cloud" discharge. At right is duplicated on a small scale the vicious lightning bolt. Static electricity of positive polarity, accumulating in the cloud above, suddenly goes on the rampage, crashing down viciously upon the negatively charged church.

take place; and no one knows when that is going to happen because the discharge point may be reached more quickly at some times than at others. To synchronize the equipment to a millionth of a second requires accuracy beyond the ability of anything mechanical. A mechanical part moving rapidly enough to synchronize in so brief a time interval would fly to pieces from centrifugal force!

Someone tried to use a high-powered rifle bullet, by firing it through two metal plates a fraction of an inch apart so that it would form an electrical connection between the plates for a brief instant. But the bullet proved to be far too slow!

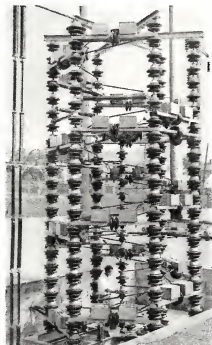
Finally, the millionth-of-a-second problem was solved by employing electric sparks for timing the circuits. The flashing sparks set the oscillograph in motion at the same instant that they release the discharge. The result is that the cathode-ray, dancing for an instant too short for the human imagination to conceive, traces the form of the electric wave on sensitized film.

In case you want to get a more accurate idea of what a millionth of a

second, or micro-second, is like, imagine that you are trying to take a picture of something moving at a speed that carries it a distance of 190 miles every second. Your camera lens focus and the distance you are from the object are such that the actual movement of the object must be no more than 1 foot while the shutter is open, in order to produce a sharp image. Your camera shutter would have to operate at $1/1,000,000$ second, in order

to open and close while the object is traveling 1 foot.

A rival of the lightning generator for impressiveness is the trio of giant transformers used in "power frequency" testing. This engineering term means that, while the impulse discharge consists generally of a single leap of the electric arc, the power frequency discharge is the arcing of a current that is alternating at 60 cycles, the same frequency as that commonly used for transmission lines, house lighting, and factory service. Thus by employing this type of discharge, the engineers can test insulating equipment under regular voltage conditions. In service, an [Continued on page 120]



A new type of artificial lightning machine, known scientifically as the 3,000,000-volt surge generator.

Homing Pigeons Carry Reports of Fishing Fleet Success

ALL too often, just when the fishing was at its best, Capt. Ed. Moore of Miami, Fla., found it was time to go home. Rather than cause anxiety when the fishing fleet failed to appear in port on schedule, Capt. Moore would signal the boats to sail for home.

Now, however, all is changed. When the fish start to bite out in the Gulf Stream, a carrier pigeon is released, and within 10 minutes the bird is in port with the message that the fishing is too good to leave, and that the boats will not be in until late.

Each boat carries a cage with three birds, one of which is always kept in reserve for an emergency. The pigeons are selected from government stock and are trained by the skippers who take them out to sea on graduated length trips.



Carrier pigeons are serving as messengers between the fishing fleet and the mainland in sunny Florida. Here are two of the feathered messengers after a fast flight from the Gulf Stream.

Auto Jacks Operate from Dashboard



This jack is operated by a 6-volt motor operated from the dashboard. Another jack raises the right rear wheel, while a third raises the front end. The same motor works all three.

AN AUTOMATIC jacking apparatus attachable to any car, enables the driver to jack up a wheel simply by turning a switch on the instrument board. One jack under the center raises both front wheels, and two jacks raise the rear wheels. The unit is operated by a 6-volt motor, wired to the battery, which drives a small hydraulic pump.

Hole Saw Has Replaceable Blades



Replaceable, split-ring blades are used in this new hole saw.

A NEW type of hole saw uses replaceable blades fitted into a permanent holder. The replaceable blades are supplied in the form of a split ring.

Cochrane Approves Skid-Proof Tub

BECAUSE insurance statistics show an alarming number of accidents occurring in slippery bathtubs, one manufacturer has decided to face the situation by producing a non-skid tub which is not only slip-proof but attractive and comfortable as well. Serpentine embossing on the tub bottom prevents slipping.



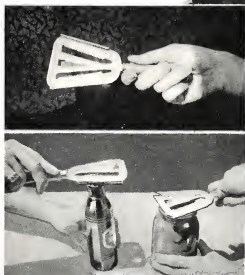
Mickey Cochrane, vice president and general manager of the Detroit Tigers, is shown here inspecting one of the new skid-proof bathtubs. Serpentine embossing prevents slipping.

Household Tasks Lightened By Simple Conveniences

THIS NEW DUST MOP is as convenient and sensibly as a paper towel. When the working surface of the paper roll becomes soiled, it is simply torn off, exposing another sheet. The paper is soft but tough, and is treated to pick up dirt without leaving dust streaks.



AN AUTOMATIC CARD TABLE is the answer to the card party-buffet supper. The handle beneath opens or folds the legs instantly, while the electric cord will serve three electric cooking appliances from a triple outlet concealed beneath the table. The table is light in weight.



THIS HANDY BOTTLE OPENER will open jars and bottles of practically every shape and description. A set of wide jaws grip large sized covers while a smaller set will take care of the intermediary sizes and open bottles.

HERE IS A VACUUM CLEANER FOR VACUUM CLEANERS.

When the vacuum bag becomes filled with dirt, it is attached to the container and the dirt is blown through the bag into a cheap sack. Air filters prevent dust escaping.



Solar Heat Generates Steam To Power Radically New Engine

THAT the sun is definitely destined to take its place in industry along with water power, coal and oil is proved by the number of inventions of recent months based upon utilizing power generated by the sun's rays.

One of the most recent of these is a device invented by Dr. C. G. Abbot, Washington, D. C., secretary of the Smithsonian Institution. Unlike most solar machines, Dr. Abbot's device acts directly upon steam producing units rather than upon a furnace or similar arrangement for producing intense heat.

In operation the sun's rays are caught in a reflecting trough and focused upon a series of steam producing plates. The power thus generated is sufficient for home use and Dr. Abbot believes it has many possible industrial uses.

The device made its first public appearance at the convention of the American Association for the Advancement of Science in St. Louis, Mo.



Here is the most advanced steam engine in the world, invented by Dr. C. G. Abbot, Secretary of the Smithsonian Institution. The sun provides fuel needed to produce steam.

Radio Stethoscope Checks Watches



The master watch, at left, turns one dial, shown in inset, once a second. The watch being checked, shown at right, has its ticks amplified by radio and registered on a second dial. Any error is shown in hundredths of seconds on the dials.

A RADIO stethoscope which amplifies the "heart beat" of a watch, provides for almost instantaneous checking of a watch which is either gaining or losing time. The new device, called a time micrometer, contains a master watch, a filtering and amplifying system, and a dial which rotates once a second in time with the master watch. Errors in the watch being checked will be shown on the dial in hundredths of seconds.

Magazine, April, 1936

Copying Machine Works In 8 Colors

AN IMPROVED type of copying machine is capable of reproducing anything written with pencil, pen, or typewriter in as many as eight colors in a single operation. A gelatin material used in place of a stencil absorbs the inks used in making the original in sufficient quantities to reproduce hundreds of copies.



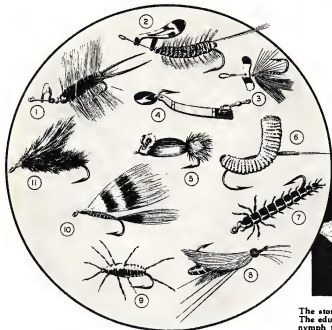
After an original has been made with special pen, pencil or typewriter ribbon, it is transferred to a gelatin sheet which absorbs the inks. The gelatin sheet is then placed in this machine and makes hundreds of copies at minimum expense.

Lures That Will Catch

by

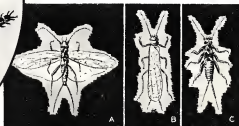
ROBERT PAGE LINCOLN

The first signs of spring find the trout fisherman checking over his rod and tackle box. Here are some advance tips that will help make that opening day enjoyable.



Here are some artificial tidbits that will tempt the most reluctant spring trout. No. 1—Hackle fly with spinner. No. 2—Wool worm type with hackles and spinner. No. 3—Fly with propeller type spinner. No. 4—Spinner for roiled water. No. 5—Buck hair mouse, one inch long, for all waters. No. 6—Typical wool worms for pools. No. 7—Artificial belgremite. No. 8—Imitation grasshopper for deep water. No. 9—Stone-fly nymph. No. 10—Squirrel hair fly. No. 11—Emerson Hough type of buck tail trout fly.

THE belief that worms are the sole answer to a trout fisherman's prayer in the early spring or Opening Day fishing is disproved by the true facts of the case. The truth of the matter is that artificial lures can be used successfully in this branch of fishing at this time of the year. The chief interest of the fisherman is to know just what it is the speckled beauties are feeding on and to select his artificial creations in accordance. A knowledge of the movements of the trout and their position in the stream is an essential. Obviously the trout will not be found at the surface, mainly by reason of the fact that there are few if any trout flies hovering over the stream, and dropping to water. Also the fish are dull and more or less inactive, clinging close to the bottom and biding the time when the streams will clear out and the warm



The stone fly nymph, C, is a favorite spring food for trout. The adult stone fly is shown at rest at B, and spent at A. The nymph fly is dropped up stream, settling to the bottom on its own accord as it is carried past a likely looking spot.

sun will bring them out to scour themselves in the riffles and sandy shallows.

The food of the trout at this time of the year is on the bottom of the stream and is composed of the nymphs (the immature or larval form of the stone flies and the May flies) and the so-called caddis flies, caddis meaning "case" in old English. Should you be unacquainted with insects and their larval forms it would be well to make a little study of them, for it can truly be said that trout fishing with artificial flies is based on these three forms, namely, the stone flies, May flies and caddis flies. Ninety per cent of the trout flies commercially made and used on our streams are an imitation of these forms, or at least they are taken by the trout in the belief that the artificial fly is one or the other of these insect forms.

Dig down in the debris of leaves on the bottom of a woodland stream and bring forth a handful of this accumulation. Now look through it carefully. Close scrutiny will reveal little cases made of bits of leaves, sticks,

The Wary Spring Trout

weed bits and even gravel. They will be soft to the pressure of the thumb and forefinger. With a pin you will be able to fork out a little whitish or yellowish grub. This is the larva of the caddis fly or the group of flies that come under the head of the order *Trichoptera*. The adult caddis fly is variously soft brown or gray, sometimes quite dark, their four wings being carried arched over the back like a tent. The winged insect is a rather shy creature, and hides under the vegetation along the stream by day, but are

out in full force toward evening, therefore imitations of them are exceptionally "taking" in evening fishing later on in May or June. The springtime fisherman, however, is mostly interested in the larval forms of these insects, namely, the creepers in their cases, and grub-imitations.

When the adult female caddis fly lays its eggs on the stems of water plants or on the bottom of the stream they hatch in due course of time into the tiny creepers. The creeper at once makes a tiny case which it pulls along with itself, being aided in this task by a pair of hooks at its posterior end. Its thorax and six legs extend out in front, its abdomen being concealed in the case. The cases as stated are made of sticks, etc., the same being stuck

[Continued on page 126]



The caddis fly, or "case" fly is another favorite of the trout. No. 1—The adult fly. No. 2—The "creeper" and No. 3 the house which the "creeper" carries as shown at No. 4.



The May fly, also known as shad fly or fish fly, is the third member of the fly family so much sought after by trout. The nymph is shown at A, the adult male at B and the adult female at C. By carefully observing the life cycle of these insects one can determine what flies the trout will be most apt to take. Nearly 90 per cent of the artificial flies base their form upon the stone, caddis, or May fly.

Already the spring rains are bringing new life to the trout streams and soon scenes like this will be familiar wherever trout are taken. No other sport has such an ardent following as does trout fishing.



Auto And Wheel Chair Combines Features to Please Invalids



Invalids find that riding becomes a pleasure in this new wheel chair. It slides into the car on rails after the center post has been removed. The rails are carried on the bumper.

Drugs Cause Sheep To Shed Wool

FOR years scientists have known that certain drug compounds of thallium would cause hair to fall out, but it was left to the Russians to make practical use of the discovery. By feeding a special formula to sheep, the wool would come loose in mats which could be pulled off without sheering. They are now perfecting the process for large scale use.

Sea-Going Auto Has 15-Knot Speed

GERMANY continues to experiment with amphibian automobiles in an effort to discover the most perfect land-water vehicle. Hans Trippel of Darmstadt is the inventor of the latest combination, a streamlined automobile possessing a speed of 90 miles an hour on land and a speed of 15 miles an hour on water. He plans to drive across the English channel this spring to test the machine more thoroughly.



Here is the latest sea-going automobile shown making a trial run near Berlin, Germany. On land it has a speed of 90 miles an hour, while in the water its speed is 15 miles per hour.

THE difficulty encountered by permanent or convalescent invalids in getting in and out of automobiles led to the much needed invention of a removable invalid's chair for automobile installation.

To fit the chair into the car, the center door post is removed. Two rails run from the floor of the car to the sidewalk, forming tracks up which the chair is pushed with ease. The post is then snapped back into position, the rails placed on the front bumper, and the car is ready for use. The chair is heavily padded and has a head rest and upholstered arms for the maximum in comfort. Rubber tired wheels adapt it for use as a wheel chair.

Tiny Soldering Unit Makes own Gas



This portable soldering outfit makes its own acetylene, delivering it by tube to the special torch built into the handle of the soldering iron. It heats the iron in about two minutes.

A PORTABLE outfit for soldering, brazing and melting makes its own acetylene, without pumping or preheating, from water and ordinary carbide. The unit is but 10 inches high and 13 inches in length.

To charge the generator, a concealed tank is filled with water to the spout level and lumps of carbide are placed in a special drawer. The gas forms immediately.

One filling of water is sufficient for three charges of carbide, recharging of which can be done when the outfit is in operation. The gas passes through a hose to a special torch in the handle of the soldering iron. It can be adjusted for light or heavy work and takes but two minutes to heat up the iron.

The soldering iron may be detached from the handle, and the torch equipped with any one of a set of nozzles for special work. The cost of operation is approximately 12c a day.

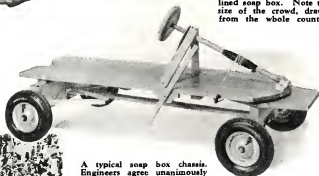
Down The Hills With The Soap Box Derby



Maurice E. Bale, Jr., 13-year-old-racer of Anderson, Ind., zipped down the long hill at Akron, Ohio, to win the 1935 Soap Box Derby by a matter of seconds. More than 50,000 boys from 53 different cities sought to win his championship title.



Here is the sensational finish of the 1935 derby with young Maurice Bale out in front in his streamlined soap box. Note the size of the crowd, drawn from the whole country.



A typical soap box chassis. Engineers agree unanimously that balloon tires add to speed.



The healthy ideas incorporated in the soap box derby have swept the world. Here is a race in Elizabethtown, South Africa. The whole city turns out to cheer the contestants on.

BASED on figures for 1935, the 1936 All-American Soap Box Derby promises to become the greatest amateur sporting event in the world. Last year there were more entrants, and the audiences were greater, than at any other single sporting event ever held.

This year the entrants will begin oiling up their speeding soap boxes early in June in 100 American cities and 30 cities in Canada, Argentina, Brazil and South Africa. As be-

fore, the contest is being sponsored by leading newspapers, and co-sponsored by the Chevrolet Motor Company.

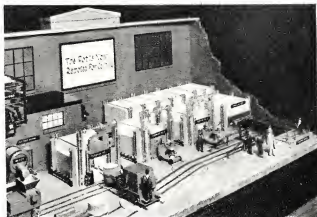
Ingenuity is the keynote of the race. There will be certain rules as to size of wheels, weight of car, and cost of materials, but beyond that the youthful car designer is given a free hand. And he takes advantage of it.

The tomato can headlights and flimsy baby buggy wheels which first made the soap box a popular vehicle have vanished. In their places have come streamlined bodies, knee action wheels, all types of brakes, and a recognition of the meaning of "low center of gravity." One thing remains. The traveling soap box must depend upon gravity alone for power. It cannot be mechanically powered, and it cannot be pushed.

The steering and the brakes are two mechanical features which provide the biggest engineering problems. Any wobbling of

[Continued on page 128]

Tiny Plant Reveals Glass Maker's Art



So that students might better understand the art of glass making, this working model glass plant was constructed by a microscope manufacturer to tour the schools. The plant is powered by special motors and relays.

Magnetic Balance Finds Meteorites

A MAGNETIC balance, originally built to aid in the location of mineral deposits and the discoveries of historic relics on old battlefields, surprised its inventor, G. L. Barnett, of Oklahoma, by proving itself invaluable in finding meteorite fragments.

H. H. Nininger, meteorite expert, employed the new device in prospecting for meteorites in Odessa crater in western Texas. With its aid he was successful in locating 27 meteorites in two days, adding further proof to his belief that the crater was formed by a meteorite.



Meteorites imbedded in the surface soil are immediately discovered with this new magnetic balance. On a recent prospecting tour, the device located 27 meteorites in two days.

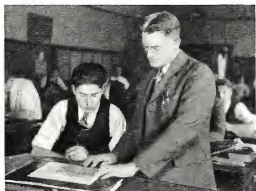
REALISM and industrial art are combined in a miniature glass plant designed to tour the schools of the country as an educational exhibit.

The model plant contains a battery of three glass melting furnaces, storage bins for raw materials, mixer, annealing ovens, casting ovens and cutting rooms, all in complete operation. Neon tubes supply the realistic glow of molten glass. Five electric motors operate the moving parts which are timed so as to produce a continuous series of operations.

While an automatic projector explains the process of making glass on a screen above the furnaces, the models move through the various stages being described. Scale size figures operate the machines.

the various stages being described. Scale size figures operate the machines.

Celluloid Drawing Checks Errors



To be correct, the student's drawing must correspond exactly with this celluloid master drawing, held by the instructor. Untrue lines are immediately detected through the celluloid.

MECHANICAL ingenuity in a mechanical drawing class at Cleveland East Technical high school led to the discovery of a time saving and accurate method of checking student drawings.

For each drawing that is required of the student during the semester, the instructor makes a master drawing on a sheet of celluloid. To check the drawing, the instructor super-imposes his celluloid sheet over the student's work, and any variance in the lines is immediately detected.

Flying Robot "Takes Over" Motors And Propellers For Pilot

A ROBOT "assistant pilot" weighing but 4 pounds, has been installed on each of the 50 coast-to-coast twin-engined transports of the United Air Lines to regulate the engine speed and adjust the pitch of the propeller blades to meet flying conditions.

The tiny mechanism, judged by aeronautical engineers to be one of the most important aviation contributions of the past year, automatically "shifts the gears" of the propeller blades, keeping them at the proper "biting" angle whether climbing, cruising, or descending. Previously the propellers were adjusted by the pilot.

In addition to being more economical and efficient than the manually controlled propellers, the robot has given the pilot more time to attend to his other duties. Then, too, since the load upon each motor is always constant, they produce a smoother flow of power, and remain in service longer.

Autos Carry Own Telephone Booths



No telephone booth is needed when calls are made over this radio-telephone. It uses micro-waves, and calls can be made without leaving the automobile. It is being tested in Rome.

TELEPHONE booths in Rome, Italy, are facing a new competitor in the form of a radio-telephone so small it can be carried by a pedestrian and which is especially designed for installation in automobiles.

The radio-telephone uses microwaves and the motorist possessing the device can phone anyone who has a similar instrument without leaving his car. The device is a refinement of the ordinary transceiver.

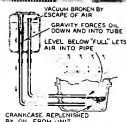
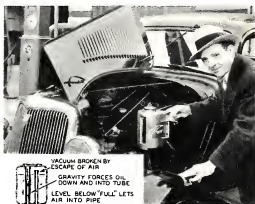


A robot "assistant pilot" is simplifying the flying of this mighty airliner. It keeps the speed of the motors constant and automatically adjusts the pitch of the propeller blades. This was formerly done manually.

Air And Gravity "Check The Oil"

THERE is no need for checking the oil with a new type of crank case oiler which automatically feeds fresh oil into the case as the supply diminishes. The simple device consists of an air-tight container for the fresh oil, an air line and an oil line. Gravity and atmospheric pressure do the rest.

The air line leading from the storage container ends at the proper oil level, while the oil feeder pipe continues down into the case. When the oil level is down, air enters one pipe, breaking the vacuum lock, and oil drops through the other.



This glass-windowed container holds fresh oil for the motor, liberating it a drop at a time as the old oil is used up. When oil drops below the air tube level, air breaks the vacuum lock as shown in the diagram.

Automatic Fire Curtain Prevents Blazes Spreading



The inventor of the asbestos fire curtain showing how even a large oil blaze may be held back by the thin protective shield. The thermostatic controls drop it into position.

Tiny Generator For Bicycles

NIGHT bicycle riding has been a dangerous sport since few riders were equipped with a suitable head and tail light due to the continual drain on the dry cell supplying the current.

A midjet generator recently placed on the market now permits the cyclist to ride in the darkness with much more safety since the supply of electricity always remains the same. At eight miles per hour the tiny power source delivers enough current to brilliantly illuminate both lights and may be turned "off" when not needed.



Attached to the frame this tiny generator operates bike's lights.

It is attached without drilling or use of special tools. The generator is driven by a small hard rubber wheel that contacts the side wall of the tire. A heavy spring holds generator in place.

A CURTAIN that automatically closes off fire from the rest of a building has just been perfected by a Slough, England, inventor. Made of special asbestos cloth the curtain can isolate a fire more effectively than steel doors which are far more costly, and much more complicated in operation.

The inventor believes that the curtain will be of special value in ship companionways and in stairways in the home. A thermostatic control of the simplest construction releases the rolled curtain as soon as the temperature increases noticeably above normal.

Using curtains of this type across all doors in large buildings the chance for a fire to spread would be slight. The curtains would smother blazes before they had a chance to gain headway.

Bridge Played Via Short Waves



Here are Mr. and Mrs. Ely Culbertson engaged in a bridge match via short wave radio. Opponents were playing at Buenos Aires and they in New York City, 6,000 miles away.

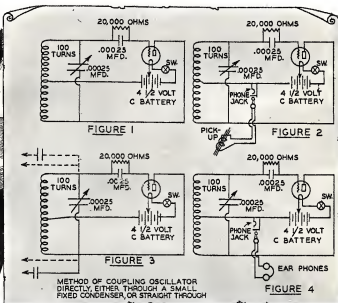
CONDUCTING a bridge match in which the opponents were 6,000 miles away sounds incredible, but the Culbertsons engaged in just such a game. Using two official "dummies" who made the plays called for by the players located at Buenos Aires Mr. and Mrs. Culbertson engaged in the International Contract Bridge match although they were in New York.

At Buenos Aires an announcer named the plays made by the South American players. The "dummies" at New York followed these just as though they were opposing the Culbertsons, themselves. At the other end "dummies" representing the Culbertsons made the plays announced over the air.

Radio Sparks



A MULTI-PURPOSE EXPERIMENTAL OSCILLATOR



The basic circuit for the various oscillator devices is shown in Fig. 1. To use as a phonograph reproducer connect a pickup in the center tapped lead of coil, as in Fig. 2. When used at a distance in balancing set's condensers connect a lead, through a fixed condenser, to Ant. post on set and one side of oscillator coil. To use as a monitor attach earphones instead of pickup.

AN OSCILLATOR device that could be used for various purposes has long been sought by the radio experimenter with a limited income. Here is an extremely simple device that can be constructed entirely from junk radio parts and used to serve an almost unlimited number of purposes.

The completed oscillator may be used to play phonograph records through your receiver by inserting a phonograph pickup in series with the plate coil lead. To use as a listening monitor the pickup is replaced with a pair of earphones. The adjustment of radio gang condensers is simplified by using the whistle of the oscillator in calibrating and lining up the set. The oscillator may be also used as a code practice device by placing a

telegraph key in the phone jacks and picking up the signal with a radio placed near it.

One of the main features of the unit is the fact that only 4 1/2 volts of C battery are required to operate it. Taps are provided at 1 1/2, 3 and 4 1/2 volts. Connect center tap of coil to 4 1/2 v. terminal, "arrow" filament lead to 3 v. and "sw" lead to minus terminal. The 1 1/2 v. terminal is not used.

The coil is wound on a 1 1/4-inch form, 100 turns of 26 D.C.C. wire, tapped in the center, being required. Either cardboard or bakelite may be used for the coil form. The variable condenser should have a capacity of .00025 mfd. The fixed grid condenser is any size from .001 to .00025 mfd. Mount the oscillator on a wooden baseboard with a panel of metal.

Musical Derby Is Unusual Radio Receiver



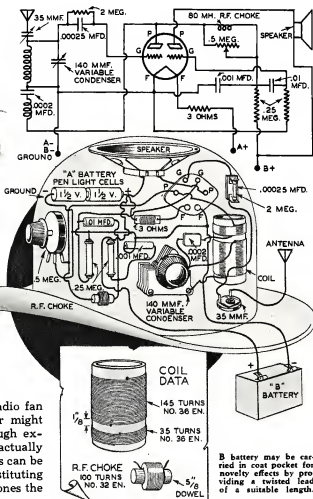
Care should be exercised in wiring up the Derby radio so that there will be no disappointments when completed. The antenna condenser should be adjusted carefully to obtain maximum results.

by BILL BARTLETT

HERE is what the well dressed radio fan will be wearing this season—or might wear if he should so desire. Although exceedingly novel, this Derby Radio actually works! Both local and distant stations can be received with fair volume and by substituting the loudspeaker with a set of headphones the range is greatly increased.

An ingenious circuit permits one tube to do the work of two. This tube, the type -19, functions as a detector and amplifier. Enough output is available from this single tube to operate the 5-inch magnetic speaker on local stations.

Secure a worn out derby and cut a two-inch hole in the top. Install the midget speaker to the crown with short machine screws then proceed to wire up the various parts placing them as far inside the hat as possible. Use a midget type variable condenser for tuning the receiver and a 500,000-ohm potentiometer for controlling the regeneration. The resistors are the carbon pigtail type which require no mounting strips. Fixed condensers used in circuit also are provided with this type of lead for easy installation.



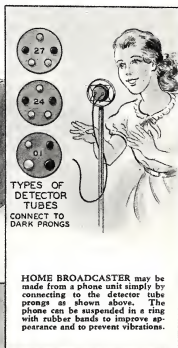
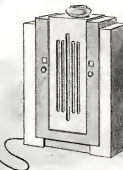
B battery may be carried in coat pocket for novelty effects by providing a twisted lead of a suitable length.

The coil is wound on either a bakelite or cardboard tube 1 1/2 inches in diameter. In winding coils be sure that both turn in the same direction or else the set won't work. The secondary winding consists of 145 turns of No. 36 enameled wire. The plate coil, which is wound 1/8 inch from the first consists of 35 turns of the same wire. The R. F. Choke is wound on a wood dowel about 5/8 inch in diameter. This coil can be wound slipshod or in layers, just as the builder desires. Its purpose is to choke out stray R. F. currents. Any wire smaller than No. 32 may be used in making the coil.

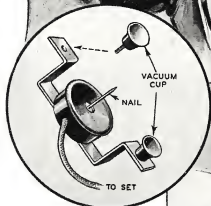
The Derby radio requires only one 22 1/2-volt B battery and two penlight cells for its operation. The set may be constructed in a few hours at a cost of less than \$5.

Novel Uses for Radio Headphones

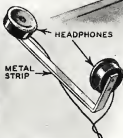
by THOMAS A. BLANCHARD



HOME BROADCASTER may be made from a phone unit simply by connecting to the detector tube prongs as shown above. The phone can be suspended in a ring with rubber bands to improve appearance and to prevent vibrations.



ELECTRIC GUITAR attachment reproduces music through radio's loudspeaker. Solder pointed nail to earphone diaphragm, mount bracket to back and use vacuum cups to hold it against instruments soundbox. The nail should contact the instrument lightly. Attach phone leads to detector tube as shown in the drawing at right.

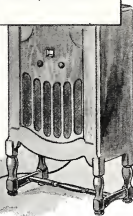


THESE NOVEL FRENCH TYPE NEED NO CURRENT FOR OPERATION

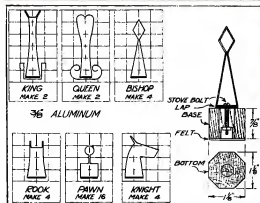
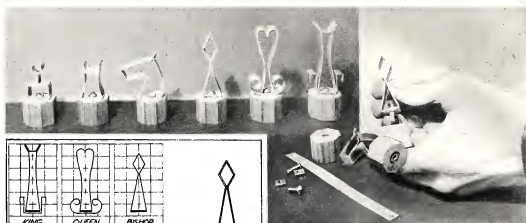
FRENCH PHONES can be fashioned from a set of old headphones by attaching to a metal strip bent as shown. The phones require no current for their operation when used over short distances. For greater distance use dry cell batteries.



COMIC SPEAKER cut from thin plywood after any comic strip character. Solder tack to phone diaphragm then mount cap to back of figure, screw on the unit until the best tone is secured. The plywood acts as a sounding board.



Modern Design For Ancient Chessmen



The construction of the modern chessman is made clear in the above illustration. Form the various characters by following the patterns. Lead may be poured in bases for ballast.

A Cribbage Score Board

WHEN playing cribbage, pinochle and other two-handed card games it is customary to keep score on a rectangular board. Confusion and arguments often arise as to whether the player is going up or down the "alley."

Using a circular score board the playing scores are "pegged" progressively to the end of the game in this way eliminating all possible confusion.

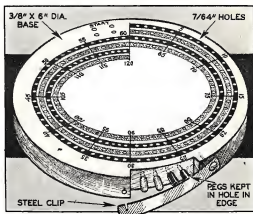
Cut the score board from a piece of $\frac{3}{8}$ -inch plywood to a diameter of 6 inches. Lay out the individual scoring lanes, painting each one a different color for easy identification. The peg holes are made with a $\frac{7}{64}$ drill and take the small pegs mounted in the recess provided on the edge of the board. These are cut from wood dowel or carved with a pen knife. When finished paint two pegs red and two pegs black to match the scoring lanes.

For a more exact job the disc can be cut from black bakelite and the pegs turned on a lathe. When this is done it is suggested that lanes and numbers be engraved.

NOVEL modernistic chessmen to replace the time-worn carved variety are easy to make. Using scrap materials for their construction the cost amounts to practically nothing at all.

Cut up an old aluminum kitchen utensil into strips $\frac{3}{8}$ -inch wide polishing them with 0-0 steel wool to bring out a bright finish. A length of square oak is chamfered down on its four edges to form an octagon stick.

From this cut out 32 pieces $\frac{7}{8}$ -inch long, drilling each piece half way through with a $\frac{1}{2}$ -inch drill completing the hole with a smaller drill, $\frac{3}{16}$ -inch. Using flat nose pliers bend the aluminum strips to the forms shown. Drill $\frac{3}{16}$ -inch holes in their ends and mount them to wood pieces with stove bolts. Complete chessmen by gluing felt to their bottoms.

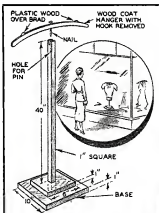


This clever cribbage or pinochle score board may be built from either wood or bakelite. A brass strip attached over the recess holds the scoring pages in place when not in use.

Modern Mechanix & Inventions

WIN \$5—HOW DO YOU PROFIT from the HOME SHOP?

Do you have workshop ideas that have provided you with an extra income, which you would like to pass on to MM's readers? For the best letters received on the subject, "Money-making Ideas From My Shop", prizes of \$5.00 will be awarded. All suggestions must be ones which have been actually tried and proved. Mere paper ideas are not wanted. Send all suggestions, including return postage if you want your manuscript returned, to:



Attractive modernistic dress display stands can be made at little or no cost from most any kind of scrap wood and a wooden coat hanger. The base of the stand consists of two blocks, one 10" and the other 6" square. The upright is 1" square and 40" long, slotted at one end to take the hanger. Finish in aluminum and black.

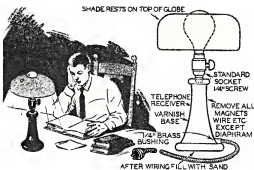
THIS MONTH'S PRIZE WINNING LETTER

Workshop Editor
Modern Mechanics Magazine
Greenwich, Conn.

Dear Sir:

Thanks to your magazine, Christmas was not as dreary as I had anticipated. Like many others out of work I have lots of spare time so I made the Modernistic Book Stand described in the November, 1934, issue and when it was completed I took it to a dry goods store and had no trouble exchanging it for merchandise.

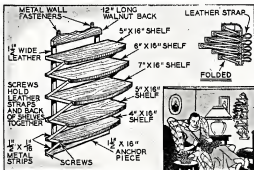
NEW PROJECTS FOR THE HOME SHOP



Phone Receiver Becomes Lamp

A DISCARDED telephone receiver forms the base of this novel type of reading lamp. The magnets are removed from the receiver and a ¼" hole drilled in the side of the case for the cord to pass through. A socket is mounted in the end of the phone by using a threaded stud. Wire up the fixture, fill base with sand and replace tin diaphragm and cap.

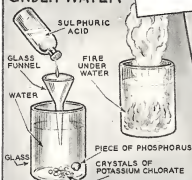
THESE folding wall shelves have one distinct advantage and that is that they can be folded down into a space 16½" long and less than 7" high. Cut the shelves from wood. Leather straps going down the back hold them together while ½" by 1¼" metal strips attached to the sides for a support to hold them rigid when in use.—Dale Van Horn.





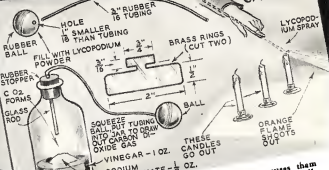
Magic Tricks for the

MAKING FIRE UNDER WATER



Mix about 20 grains of potassium chlorate with a piece of phosphorus the size of a pea. Place this in the bottom of a jar then fill with water. Add sulphuric acid to this with a glass funnel. Water bursts into flame.

MYSTIC
CANDLES

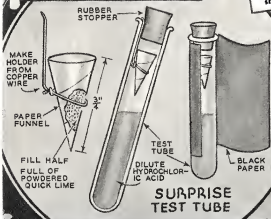


Bring the finger next to the condenser either causes them to go out or shoot a flame 1-foot long. Get two small balls and stretch length of rubber tubing. Fill one ball with lycopodium and the other with carbon dioxide gas made as usual. Squeezing balls increases flame or puts it out.

MAGIC FIRE



SURPRISE TEST TUBE



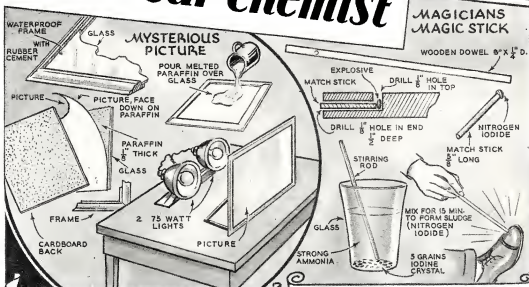
Hand this test tube to a friend to hold, then watch the surprised look on his face when he finds it becoming too hot to handle. Partly fill a test tube with dilute hydrochloric acid. Make a small wire support and in it place a paper funnel half full of powdered quicklime. Test tube is then corked and a sheet of black paper wrapped around it. Cere should be taken so as not to shake the liquid. Just before handing the test tube to the victim turn bottom up so that the hydrochloric acid and quicklime mix.

To produce fire from thin air get a wide-mouthed jar and in it pour 10 drops of sulphuric acid. Place grains of potassium permanganate in the end of a length of glass tubing, sealing one end so that the chemical does not run out. Saturate a piece of cotton in alcohol and place it on a piece of tin. To produce the effect place the open end of the glass tube into the jar then touch to cotton.



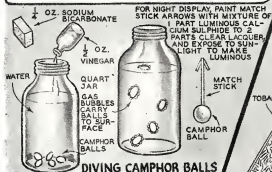
Amateur Chemist

MAGICIANS MAGIC STICK



A blank picture frame placed before two bright lights soon develops into a colored picture. Secure a picture frame with a tight fitting glass. Pour a thin layer of paraffin over glass. When dry place a picture in frame face down. As long as the wax is hard the picture is not visible. The heat radiated by the lights melts the wax and exposes the picture.

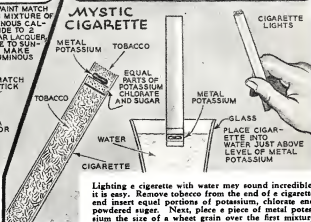
This wand explodes when object is touched. Drill 1/2" hole in rod, 1/2" deep. Mix 5 grains iodine crystals with strong ammonia for 15 minutes until brown sludge forms. Remove a small amount and allow to dry. Place in wand, then insert match stick or stick of similar diameter. Force of stick coming in contact with chemical causes explosion.



DIVING CAMPHOR BALLS

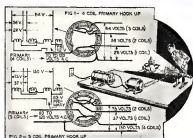
Camphor Balls mysteriously rise to the top then fell to the bottom only to rise again. The jar is filled 3/4 full of water after which 1/4 ounce of baking soda (sodium bicarbonate) and 1/2 ounce of vinegar are added. Small sticks covered with luminous paint give the trick a weird appearance when viewed in an unlighted room.

MYSTIC CIGARETTE



Lighting a cigarette with water may sound incredible, it is easy. Remove tobacco from the end of a cigarette and insert equal portions of potassium, chlorate and powdered sugar. Next, place a piece of metal potassium the size of a wheat grain over the first mixture and finally replace the tobacco which was removed. To present effect submerge end of cigarette in water.

FOR THE AMATEUR ELECTRICIAN

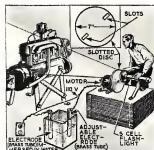


Transformer from Old Generator

THE field coils and frame of a discarded auto generator either for stepping up or reducing A. C. current. Remove the armature and brushes until only the coils remain. Connecting all coils in series (fig. 1) the output of the transformer is 28.56 and 84 volts. Three coils in series (fig. 2) delivers voltages of 37.75 and 150. For continuous service immerse transformer in a container filled with auto oil to prevent overheating.—H. Jost.

Stroboscope Checks Motors

This simple stroboscope permits the study of moving parts so as to show how they stand up during operation. The unusual illusion makes speeding objects appear to be standing still. While these devices are usually quite complicated this one can be constructed by anyone at little cost. Make a slotted disc and attach to the shaft of an electric motor. Place a flashlight behind the disc then start up both engine and motor. Adjustment of the motor speed is made by placing two 1-foot brass tubes in a salt solution to form a chemical rheostat.—A. Wilkens.



Electric Tool Magnetizer

SCREWDRIVERS and other tools may be magnetized by placing them in a coil made by winding 200-turns of bell wire on a 3/4-inch form. As current must pass through coil only for an instant a simple tin foil fuse is placed in the circuit as shown. As this must "blow" each time a tool is magnetized a thin foil should be used.—W. Wenger.

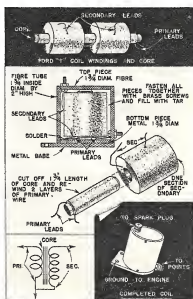


A Midget Spark Coil for Models

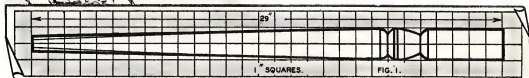
A SPARK coil for use on models employing miniature gasoline engines can be constructed from an old model T Ford coil. Cut the secondary winding in half being careful not to damage the fine wires. Cut 1 3/4 inches off the laminated wire core and on it wind a new primary coil of two layers. This is slipped into the secondary winding and wired up with one end of it and one end of the secondary being common.

Mount the coil in a fibre tube and fill the remaining space with melted beeswax. Attach insulated terminals for one primary and one secondary lead with the common lead grounded to the engine in the usual manner. Use a midget radio condenser in place of the original coil condenser being sure that it is of the same capacity and voltage rating as the other.

This coil is smaller than most coils for model use although it produces a hotter spark. It is often possible to place the condenser inside the fibre case making the unit self-contained and in this way keeping out dust and dirt.—M. Olsen.



Combination DESK and VANITY in COLONIAL design — by OSCAR OLSON

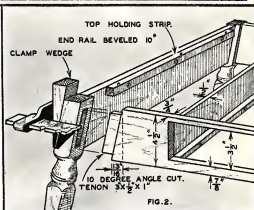


Above, the completed Colonial Desk and Vanity with bench to match. Lay out the pattern for the legs in 1-inch squares being careful to make all four exactly alike. Notice, at left, the method of assembling frame. Apply sufficient glue and draw clamps as tight as possible to insure firm unions.

THIS truly serviceable article of furniture is made in authentic Early American design. It serves equally as a writing desk or vanity, and however used will prove itself very adaptable. Either hard maple, white birch or black walnut should be used in its construction, as they are woods characteristically Colonial.

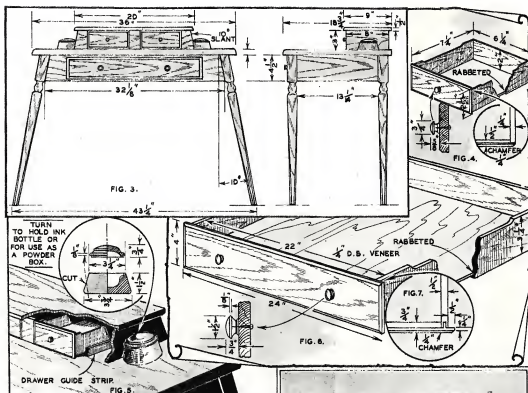
Start by cutting out the legs of 2"x2" stock, following dimensions in Fig. 1. The taper should be uniform with well defined edges. Work the leg slightly over finished length to compensate for the ten degree top cut, due to leg slant. This cut permits the top to fit squarely on the leg.

The side, and end rails are made next of 3/4" stock. Front and back rails have end slants of ten degrees, while the end rails are cut square. Be exact with all angle cuts, to



assure close fitting joints. Cut out drawer opening in the front rail. Screw the top holding strip to end rails and bevel both rail and holding strip, ten degrees, in one operation. Cut mortise and tenon joints, then glue and assemble frame, using clamp wedges as shown in Fig. 2, drawing all unions tight. Next

A HANGING MIRROR CONVERTS DESK INTO VANITY



General dimensions of desk and drawers are given above. Wooden bowls for holding either ink bottle or powder boxes are turned on the lathe. These fit close to drawer frame.

make the drawer slide boxing of $\frac{1}{2}$ " stock. Notice that this boxing comes flush with drawer opening, and should have slide strips fastened to the lower edge, as also shown in Fig. 2.

The top specifications are shown in Fig. 3. As the top will have to be made up of several boards glued together, select those of uniform grain and color. This is particularly important when working with maple or birch.

The small drawer compartment is made of $\frac{1}{2}$ " stock, and has a mitered end slant of ten degrees, dimensions shown in Fig. 3. The end boards are beveled ten degrees above and below. Cut drawer openings $\frac{1}{16}$ " larger all around then the dimensions of the small drawer face. Place the compartment frame on the main top, mark position of the drawer guide strips, Fig. 5, and fasten them securely to the desk top. Next screw the compartment top to the frame with small holding strips and fasten assembly to the desk top with screws from below. A little study will show the need for definite procedure in assembly



The compartment top is secured to the frame by using small holding strips and fastening the assembly to the desk top with small screws making sure to keep them well hidden.

operation at this point in order to keep all screws hidden.

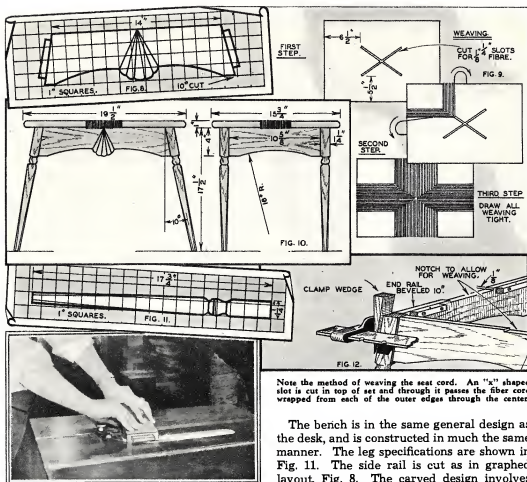
The small drawer is constructed as shown in Fig. 4, with rabbeted corners that bring the

COLONIAL FURNITURE BLUEPRINTS

Entered blueprint plans for constructing the Combination Desk and Vanity are available at fifty cents per set.

Other Colonial furniture blueprints can be obtained at twenty-five cents each for the following: Four-poster bed, bedside combination table and lamp, ladder-back chair, chest of drawers, bridge lamp, end coffee table. Send order to MODERN MECHANIX PUBLISHING COMPANY, Greenwich, Conn.

SIMPLIFIED PLANS MAKE CONSTRUCTION EASY



Note the method of weaving the seat cord. An "x" shaped slot is cut in top of set and through it passes the fiber cord wrapped from each of the outer edges through the center.

In making mortise and tenon joints the use of the power saw will insure uniform work. The saw is adjusted and the work cut on all sides. Care must be taken so that saw cuts at angle.

sides flush with the drawer face. The bottom is held in a rabbeted channel and glued in place. The large drawer, Fig. 6, has a modified rabbeted cornered joint, with a $\frac{1}{2}$ " overhang as defined in Fig. 7. The draw knobs are turned on the lathe and fastened to drawer face with round head screws. Adjust small drawer stops to bring face chamfer even with the compartment edge.

Next turn the bowls as shown in Fig. 5. The inside turning of which is made to hold powder, or a small inkwell. Notice the cut line in diagram, this cut permits the bowl to fit close to the compartment frame. Fasten bowls to desk top with screws from below. Round corners of the small and large tops and sand over-all with number 00 sandpaper.

The berich is in the same general design as the desk, and is constructed in much the same manner. The leg specifications are shown in Fig. 11. The side rail is cut as in graphed layout, Fig. 8. The carved design involves only straight cuts, and is simple to make, and adds greatly to the appearance of the finished piece. The end rails have edge bevels of ten degrees, Figs. 10 and 12. Use clamp wedges, as before, to draw all joints tight.

Construct bench top to specifications shown in Fig. 10. The weaving, which is done with $\frac{1}{8}$ " fiber cord, is processed in three stages as depicted in the drawings of Fig. 9. Cut a $\frac{1}{4}$ " cross slot as shown in first step and round edges slightly to prevent fraying of the cord. Anchor one end of the fiber and weave one-half section at a time, as shown in step two. Proceed with the remaining half in like manner, and draw up as tight as possible. This completed, stain the fiber the color desired and apply two coats of shellac. The stain and shellac will contract and toughen the fiber, but be careful in applying them so as not to

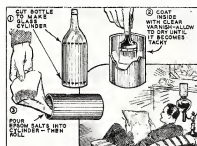
[Continued on page 122]

HELPFUL IDEAS FOR THE HOME MAN

Adjustable Shelf Supports

STRIPS of corrugated iron attached to the inside of a wooden cabinet make excellent adjustable shelf supports. The strips may be cut to fit any size cabinet, the exact size being entirely up to the builder.

Cut the shelf boards from stock that will slide into the grooves provided by the corrugated metal. Plane down the edges and, finally, round them off with sandpaper until they fit perfectly.—A. H. Waychoff.



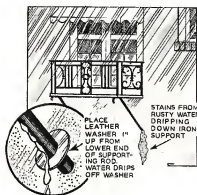
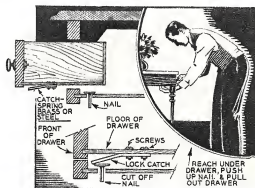
Crystal Lamps Made From Old Bottles

OLD bottles can be converted into beautiful modern crystal lamp globes at practically no expense. Green or red beverage bottles make the most attractive globes although any other colors can be used. Cut off the bottle and file the edges smooth. Give the inside of the glass cylinder a coat of clear varnish and when it becomes tacky pour ordinary epsom salts into it and rotate until the salts adhere to the surface. The salts produce a translucent finish resembling cracked ice.—K. L. Wilson.

A Simple Secret Drawer Lock

A SECRET lock is often desired on some drawer so as to keep prying eyes from coming in contact with matter of no interest to them. Insurance papers, deeds and other personal documents can be placed in a drawer equipped with this secret lock with no fear of it being opened by other parties.

Remove the drawer and drill two holes in the bottom to take a length of spring brass or steel. Cut off a nail and install it under the spring so that when pushed up it frees the drawer.—E. Alger.



Preventing Rust Stains On Walls

DARK rust stains often appear below the metal supports of ornamental iron balconies and fire escapes detracting from the beauty of the home. These marks are caused by the rain washing away the paint on the metal and forming rust which dissolves in the rainwater and is deposited on the wall below the metal support. While appearing hopeless, the trouble can be corrected in a few minutes at practically no cost.

Cut a leather washer about two inches in diameter and slip over each of the metal supports about one inch from the wall. Rain will now run down the metal support until it reaches the washer and drop off leaving wall clean.

BUILD This Simple Automatic PHOTO Printer

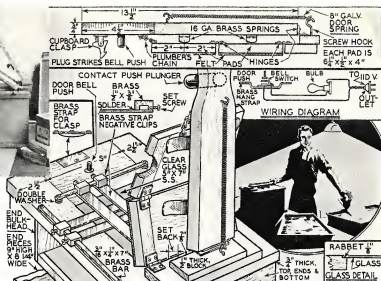


AMATEUR photographers need not be content with a slow printing device if it is the cost that is holding up the construction or purchase. The automatic printing device described here can be made for as little as two dollars and will turn out prints as rapidly as you can lay the printing paper in place.

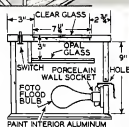
Build a good strong box out of $\frac{3}{4}$ " pine, making the ends $8\frac{1}{4}$ " by 9". The sides are cut from $\frac{1}{4}$ " plywood and the bottom of $\frac{3}{4}$ " stock chamfered to form a neat base. Build the top of $\frac{3}{4}$ " stock using $2\frac{1}{2}$ " side widths with the open ends bridged with strips having the grain running in the opposite direction. When this is completed glue up the top frame, plane and finish, fastening the box with screws or nails.

Inside the box, three inches from the top, fasten stringers rabbeted for a piece of opal glass. This may be purchased at any glass store. Below this, on the side of the box, attach a porcelain cleat socket to take a 25-cent photo-flood bulb. The socket is wired up through a simple switch made from a brass strap which completes the circuit only when the lid is closed. The lid, itself, can be made from the back of 5" by 7" printing frame.

The negative clips are of brass and soldered to brass slides as shown. Two brass bars to which they are attached permit their adjustment to any size negative. These brass negative clips also furnish a border guide for the printing paper. After all parts have



The automatic printer should be adjusted so that the photo-flood lamp does not go on until the lid has closed completely. A small door "catch" on the end of the handle will keep it down when making a print. A light screen door spring returns the lid to an upright position when "catch" is released. It is important that the printing box is light tight. Timing is very important and can only be determined by experiment.



The negative is slipped under brass clips and finely the paper is placed on top of the negative and the lid closed.

been installed the inside of the box is painted with aluminum so as to reflect the heat. If desired a second porcelain socket, which is permanently connected to the electric supply can be installed next to the first. A 10-watt orange lamp inserted in it permits examining of the negatives position on the print paper without fogging the print.

To make a print insert the negative under the clips then place over it the printing paper and pull down handle for correct exposure which can be obtained by using test strips until best time is found.

PRACTICAL HINTS ON



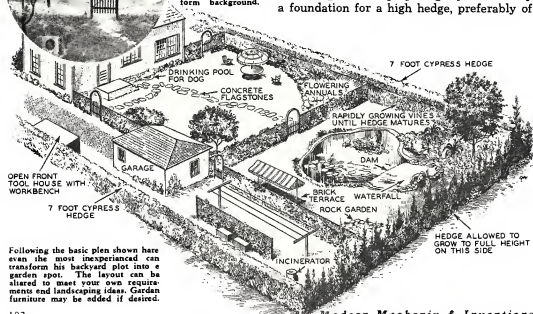
Above—A home before it was landscaped. At left—the same home surrounded by an evergreen hedge. Who would believe it was the same house?



At left, the garden just after landscaping. Above is the same garden a few months later. Vines completely cover the wire fence and evergreens form background.

IT IS by no means a costly process to transform your own backyard into a beautiful miniature park area no matter how uninviting it may now appear. The secret of its low cost is in the construction. Instead of doing the entire yard at one time a small area is landscaped and the unfinished portion shut from view by means of a temporary screen of rapidly growing vines. Within a period of one year the homeowner may completely landscape his grounds and complete his plans in the years that follow. This is the time of year to plan changes that can be made during the spring and summer.

Most everyone desires privacy and so the first thing to do in preparing a yard is to lay a foundation for a high hedge, preferably of



Following the basic plan shown here even the most inexperienced can transform his backyard plot into a garden spot. The layout can be altered to meet your own requirements and landscaping ideas. Garden furniture may be added if desired.

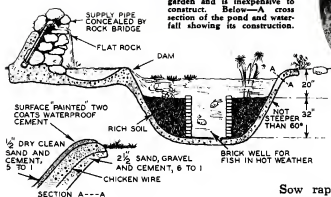
BACKYARD LANDSCAPING

by HI SIBLEY

Without previous experience, and at very little cost, any backyard plot can be transformed into a natural wonderland in spare time.



This simple waterfall adds greatly to the beauty of the garden and is inexpensive to construct. Below—A cross section of the pond and waterfall showing its construction.



A corner of the pond with the water plants in full bloom. Evergreens completely close off the background. Appropriate furniture makes the garden a delightful outdoor room.

evergreen, such as cypress. First, dig a trench at least 12" wide and 18" deep just inside your property line around the three sides. In the bottom place kitchen refuse followed by leaf mold and wood ashes, sifting in a little dirt as you proceed. Allow this to decompose for about six months after which the hedge is ready for planting.

The plants can be purchased in most sections for as little as \$1.50 per hundred. Set out the plants 12" apart until they completely surround the three sides of the yard. It is not necessary that they all be purchased at one time. They may be set out a hundred at a time just as the pocketbook will allow. While these are growing an inner screen of chicken wire may be erected.

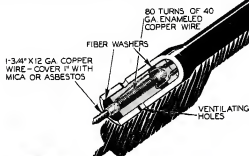
Sow rapidly growing morning glory seed around the fence followed by either English ivy or honeysuckle so as to provide for the coming years. The morning glory seed will fill the screen with vines during the first year. After the hedge has matured the vines may be removed.

The yard closed in, the amateur gardener may carry out the smaller details. Rock gardens, although quite simple to make, will add beauty to an otherwise uninteresting corner. A small pond, waterfall or bathing pool can be constructed for as little as \$15. If only for decorative purposes, the pond should contain water hyacinths, lilies, cat-tails and other water plants. Provision should be made for draining the pond which can be siphoned or connected to the sewage system.

An Electric Pencil for Decorative Etching

THIS electric pencil costs only a few cents to make, but with it you can write your name in gold on personal belongings such as luggage, hat bands or wallets. It is also useful in ornamenting glassware, portrait mountings, book covers and shop projects. The pencil is so simple that a child can operate it.

The holder is turned down on the lathe from hardwood or made from fiber tubing. A hole is drilled through the holder for the



No dimensions for the holder are needed since this can be left to the builder's discretion. Drill two holes in the end of the holder for ventilation. The fiber washers on the element should fit in the handle.

fixture wire to pass. The heating element is made from a piece of 12-gauge copper wire 1 3/4" long, filing one end to a smooth blunt point. Wrap a 1" strip of thin asbestos, moistened with water glass, around the wire and on this wind 4 1/2 feet of 40-gauge enameled wire. This wire can be taken from the secondary winding of an old Ford spark coil. This done, slip a fiber washer on each end of the heavy copper wire, connect the fine leads to a length of fixture cord and insert unit in holder.

To make the embossing paper secure some "onion skin" paper and coat one side with a bronzing liquid made by mixing 1 oz. turpentine with a half teaspoon of varnish, then dissolving 1/2 oz. resin in this. Finally mix in 1 teaspoon of bronze powder or any other pigment, if other colors are desired. After bronze has dried connect up pen through 40-watt lamp. When tip becomes hot place paper face down on article and write in usual manner.



Heating element is made by winding No. 40 enameled wire around asbestos and 1 3/4" length of No. 12 copper wire as shown at right. An old Ford spark coil provides the fine wire required for making a heating coil.



The holder, after being turned down is left in the lathe and hollowed out using a drill in the manner shown. Drill hole for the fixture wire in the same manner using a smaller drill.

Anchor the fine wires to holes drilled in the fiber and washers so that the fixture cord may be attached without danger of pulling loose the coil. Washers should fit tightly in the end of the holder.



The embossing paper is prepared in the manner shown. After mixing the solution apply it to strips of "onion skin" paper and allow to dry. To use, place face down and write on back with the point of an electric pencil.

Colored Plastic Initial Buttons Fashioned On Jig Saw

ATTRACTIVE buttons for sports wear or other apparel can be cut from plastics such as bakelite, catalin, duralite or even metal. Small holes drilled near their centers provide for fastening in the usual manner.

The buttons are cut with a hand or power driven scroll saw using a fine toothed blade. The letters are traced on the plastic material by using news type or an artist's lettering guide for a pattern. After cutting out sand the edges smooth.



Original buttons such as these may be cut out of bright colored plastics using only a jig saw, hand or power driven. Club or fraternity emblems can be made in the same manner.

Simple Linoleum Wall Plaques

ORNAMENTAL wall plaques can be made without previous experience from scrap solid color linoleum and plywood. The scroll design is first cut in the plywood; then with a wood chisel the top layer of plywood is removed from the board except at top and bottom where the design appears. The linoleum is cut to fit oval recess after which it is glued in place.

When dry, the linoleum is laid out in squares and the design traced on its surface. Cut along the lines with a sharp pen knife following this by removing the background with a gouging tool. Finish by staining the scroll and polishing the linoleum with wax.

Emergency Electric Heating Pad

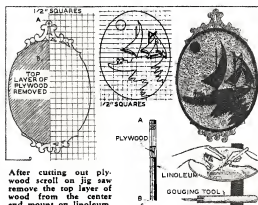


Two pie pans, a light socket and cord form this simple, but very practical, electrically heated pad.

AVERY efficient heating pad for emergency use can be put together in a few minutes using two ordinary pie tins and a light socket and cord. The tins should measure 8" in diameter and about 1 1/4" deep. Cut a recess in the edge of each

pan just large enough for the socket to fit into. Drill several holes in the flanged edges of the tins so that they can be bolted together.

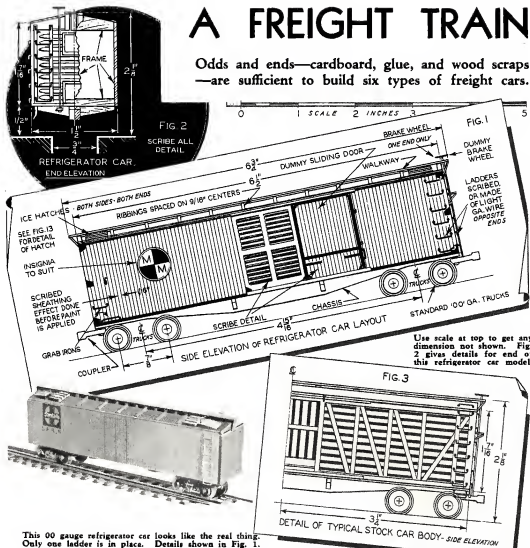
After completing the heater install a 40-watt lamp in the socket and assemble with machine screws. The light is turned on and in a few minutes the pans are quite warm. Wrap in towel to distribute heat.



After cutting out plywood scroll on jig saw remove the top layer of wood from the center and mount on linoleum.

A FREIGHT TRAIN

Odds and ends—cardboard, glue, and wood scraps—
—are sufficient to build six types of freight cars.



This 00 gauge refrigerator car looks like the real thing. Only one ladder is in place. Details shown in Fig. 1.

CARDBOARD, glue, wire, and some scrap pieces of wood are all the materials needed to make a complete set of bodies for an 00 gauge model railroad freight train. Six different types of cars—refrigerator, stock, gondola, hopper, flat, and caboose—are described here, offering enough variety to round out the rolling stock of any model system.

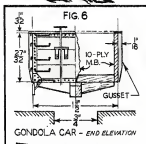
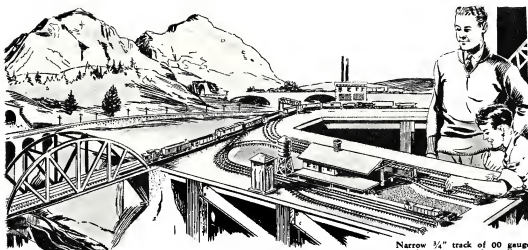
All cars have been designed to fit a standard chassis to simplify construction and to permit the builder to turn out a number of similar parts for several cars at one time. The caboose alone requires a chassis of somewhat different dimensions, but the method of construction is similar to other cars.

If the model builder has the wheel trucks,

By using narrow strips of cardboard realistic stock car can be produced, though open effect can be obtained with paint.

it is no trick to turn out a complete car in an evening. The trucks can be built up, but in most cases it will be found simpler, and often cheaper, to use the standard trucks supplied by model houses. This also applies to couplers and, if the builder desires, such de-

for Your Model RAILROAD



BUILD RAILROAD EQUIPMENT FROM MM PLANS

The following 00 gauge blueprints are available. Order by number and send check or money order to Blueprint Dept., Modern Mechanix Publishing Co., Greenwich, Conn.

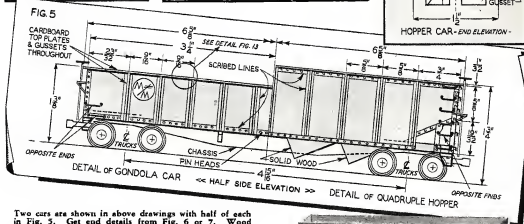
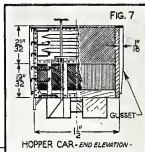
M-407—"Tiny Tom"—Steam outline locomotive, Atlantic 4-4-2 type—\$3.00.

M-405—Pullman Coach—25c.

M-406—Model Railroad Equipment—Instructions for building turntable, drawbridge, semaphores, crossing gate—25c.

M-409—Freight Train—Six cars in this article—\$1.50.

Narrow $\frac{3}{4}$ " track of 00 gauge permits a very complete railroad system to be installed in small space. Buildings and bridges can be built from stiff cardboard.



Two cars are shown in above drawings with half of each in Fig. 3. Get end details from Fig. 6 or 7. Wood blocks, shaped as shown, simulate the underframe hoppers.

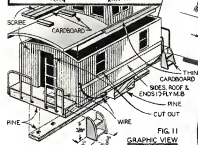
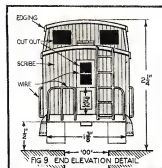
tails as brake wheels and ladders can be purchased, simplifying the task of turning out a number of cars in short time.

The chassis of the cars described here is built of wood, following the dimensions in Fig. 12. The dimensions of the caboose frame are also given in this sketch and are



Except for ladders, brake wheel, and hoppers this model hopper car is complete. Rails and trucks shown are standard.

Model Caboose Adds Finishing Touch To Freight Train



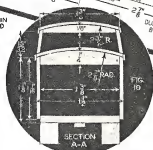
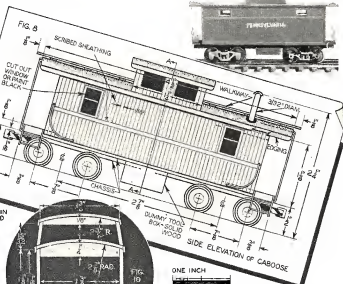
Stronger steps can be built of thin sheet brass soldered. Cement cellophane inside windows for glass. Use pencil for scribe.

differentiated from the freight car dimensions by bolder type lettering as well as figures in circles.

The five types of cars and the caboose as shown in the accompanying plans may all be built on this chassis. They differ only in detail. We will first describe the building of the chassis or lower frame and then proceed to describe the construction of a typical box car—a refrigerator car as illustrated in Fig. 1.

First shape the central girder, cutting it out carefully to the given dimensions and drilling it at each end for the truck and coupler bolts. The trucks are centered $4\frac{1}{8}$ " apart on the girder. The trucks are attached by means of $\frac{1}{16}$ " diameter escutcheon pins which are pressed into the holes in the girder. Small washers may be used to separate the truck bolster, or cross member, from the frame. The couplers (commercial ones are best and cheapest) should be pivoted near the extreme end of the frame, at each end and the girder glued with model airplane glue to the car floor. This is simply a piece of pine, $\frac{1}{8}$ " by $1\frac{3}{8}$ " by $6\frac{1}{2}$ " long. It forms the floor and base of the car.

Pine or any hardwood is suitable for all



This center cross section shows the construction and dimensions. Cupole can be built of solid block of wood glued to roof former instead of building up with cardboard and wood as shown here.

Photo at top shows completed model caboose, slightly different in detail than car shown in drawings. No model line is complete without a caboose. This one is very simple and easy to construct.

frame members. Balsa is not satisfactory because it is so light that the car trucks would not have enough weight to carry them over the switches

without derailling.

Little more work is necessary to complete the lower frame. All cars except the quadruple hopper and the caboose have side webs or plates which are glued in place as shown in the drawings, Fig. 12. Cut the plates out of $\frac{1}{8}$ " pine following the dimensions given and cement them against the frame girder and bottom piece.

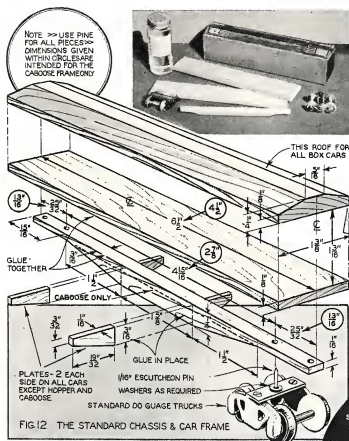
The caboose chassis is made similarly but the girder is not "dropped" as in the case of the freight cars, but is a uniform $\frac{1}{16}$ " depth.

Make up as many frames as you plan to build cars and do this work before starting to work on the bodies.

Apart from the caboose, which is different in size as well as appearance, the freight cars illustrated here can be divided into two types: box or closed cars, and open cars such as the gondola car and the hopper car.

The refrigerator car is typical of the box car construction. The first requisite after having the frames is to make the roof. This

One Frame Standardized For Five Cars



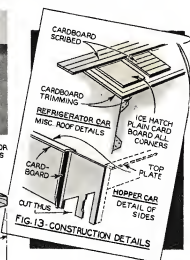
The underframe and floor in Fig. 12 is used on all cars except caboose. Dotted lines and circled figures indicate underframe and floor dimensions for caboose. At right is complete detail for flat car built on standard chassis.

roof is shaped from pine to the dimensions given in Fig. 12. The pitch, or slant, of the roof should be carefully worked with a plane and it is a good idea to shape up a considerable length at one and the same time so that later it can be cut into $6\frac{1}{2}$ " lengths for as many cars as you wish to build.

The ends and sides of the cars are next attended to. These are cut from hard cardboard—preferably photo mounting board, obtainable at most stationers or art supply houses. Before gluing the ends in place scribe or line the cardboard with a hard pencil to get the sheathing effect. The scribing for the sheathing should be done about $\frac{1}{16}$ " apart.

The ends are glued in first flush with the top of the roof and the bottom of the floor.

[Continued on page 122]



Details of hopper and refrigerator car in Fig. 13 add realism to model. Cardboard ends of box cars should come up to top end of roof former. Roof cardboard should overlap sides and ends about $\frac{1}{16}$ ". Trimming under eaves is a $\frac{1}{16}$ " strip. Photo (shown at top left) shows parts of the car.

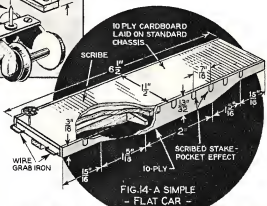
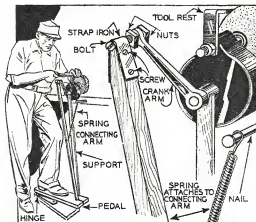


Photo shows box car body complete, another partially finished. Cardboard ends are glued to floor and roof first, then cardboard sides cemented in place after being scribed.

SHOP TASKS MADE EASY



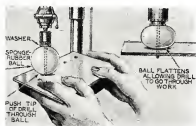
Foot Propelled Bench Grinder

USING a hand bench grinder for sharpening tools is quite difficult since only one hand is free to guide the tool during the grinding process. Any grinder can be easily changed over for pedal operation so that both hands may be free to handle the work.

Make the pedal, connecting arm and grinder support from any hard stock. Remove the handle from the grinder and replace with an iron bolt. A strip of strap iron on the connecting arm acts as a joint. The other end of the arm goes to the pedal groove. A screen door spring attached to the bench and arin keeps the pedal in an upward position as well as furnishing the driving power.—G. Gower.

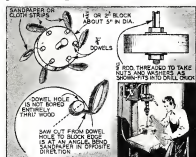
Rubber Ball Prevents Drills Breaking

A SEMI-HARD rubber ball with a hole drilled through its center makes a worthwhile anti-drill breaking attachment that will be appreciated by any shop-man. After selecting the necessary drill slip the rubber ball over it, but first place several washers on top so that the ball does not loosen the chuck. The ball prevents drill from snapping off by forming a rigid support, flattening out to allow the drill to pass through work.



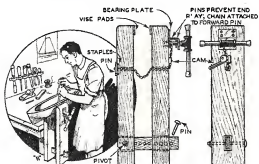
A Drill Press Sanding Attachment

A SANDING attachment that will do excellent work is made from a wood disc to which has been attached $\frac{3}{8}$ " diameter wood dowels. The disc, itself, is 5" in diameter. A shaft is attached through the center of the disc so that it may be attached to the drill press when completed. Opposite each dowel hole cut a slot at an angle in the direction of the rotation of the drill. Insert strips of sandpaper or emery cloth into the slots then force the wood dowels into the holes to hold the sandpaper in place.—D. Van Horn.



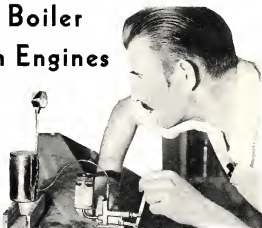
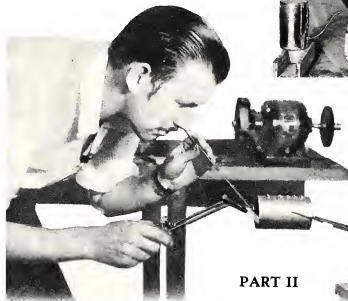
Chain Operated Wood Vise

THE workshop fan can make his own bench vise at slight cost. Instead of the screw clamp a chain, which winds around the handle, is used. The handle is formed from a length of pipe and a suitable tee. The vise jaws may be of any hard wood with the fulcrum adjustable through a pin arrangement. The work is held rigid by turning the handle, taking up all slack in the chain and then locking by dropping simple cam.—W. C. Wilhite.



Learn Brazing on the Boiler of Your Model Steam Engines

This article takes up the steam plant for the 2 model engines described last month. It is an instructive project for home shops.



Boiler is tested, as shown above, by soldering small gauge to outlet pipe and small water pump to filler cap. This design withstood a pressure of 150 lbs. Before generating steam for the engines it is better to try running models on compressed air through boiler. Left—Brazing the fire tubes to the boiler shell. Work on the bottom as shown and turn cylinder over to work on other side. A cheap, small gasoline torch, such as can be purchased at almost any auto supply shop, will serve satisfactorily for brazing.

PART II

by ALEXANDER WOOD

BEFORE the two model steam engines described last month can be put into operation, they must be provided with a steam generating plant. That is the purpose of this article—assembly of a suitable boiler and fire box to generate steam for either the poppet valve or oscillating engine.

While the engines themselves required no castings, they did entail a fair amount of lathe work. The boiler on the other hand is mostly a brazing job and before describing its construction, a brief explanation of brazing, as distinguished from soft soldering and welding, will be given.

The term brazing is highly misused. There is nothing at all difficult about it, in fact it is much easier than soft soldering for the temperatures used are higher and the work has a tendency to be cleaner. In essence it is simply soldering done with a solder known as "silver solder." This melts be-

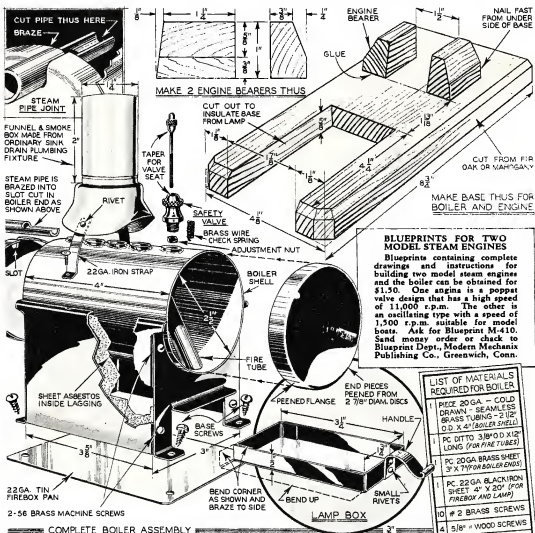
tween 1,200 degrees F. to 1,400 degrees.

In ordinary soldering the idea is to heat up two pieces of metal so that a solder which melts at around 300 to 700 degrees F. will flow neatly across the seam and hold the pieces tight. That it is seldom neat is due to the fact that amateurs try to paint the stuff on with main strength, little realizing that the iron should be properly used for transferring heat to the metal to be joined and that the solder should be applied to the heated surfaces if it is to flow smoothly.

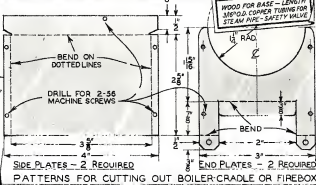
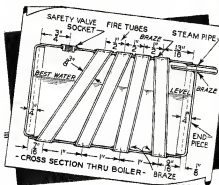
Brazing is nothing more than the same principle but applied at higher temperatures and by different means, using a direct flame to apply heat instead of a soldering iron.

Brazing is then of the same family as soldering and joins metals by still another but softer metal while welding, another close relation, fuses two metals together without a third and externally melted metal.

Single Page of Drawings Covers Complete Construction of Boiler



Strap iron to funnel and side plates hold boiler in place. Steam pipe is cut as shown to deflect water from steam line. Wood base shown here will be suitable for both types of engines.



Side and end plates are fastened together with machine screws. Wet sheet asbestos to make it stick to the iron. Alcohol compounds are put into the fire box to provide fuel. Safety valve pops at 30 lbs.

Brazing is Best Way to Solder Difficult Joints

In brazing, where brass or the non-ferrous metals are treated, silver solder—compound of tin, zinc, silver, brass and copper in such adjusted proportions that the melting point is below that of the brass—is applied.

The joints are always tight, very cleanly prepared and well fluxed with some acid flux such as can be obtained in good hardware stores. As heat is applied the flux turns to a white powder and, as the heat is raised to a cherry or bright pink red, the solder is applied in light thread form behind the flame. It runs into every pore, cranny, and fissure

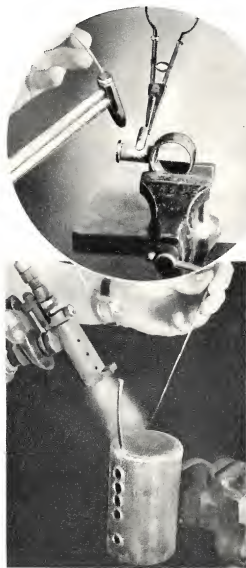
and leaves a thoroughly clean joint and a tightly locked surface. It is a joint as strong as the brass itself. Hence the well known term "sweating it in" which is applied to this type of work.

In the case of ferrous metals a brass brazing spelter is used in place of silver solder. It consists of flux and powdered brass filings and does the same work with iron as silver solder does with brass, gunmetal, and other non-ferrous metals. Spelter rods, ready for use, can be had from any hardware store.

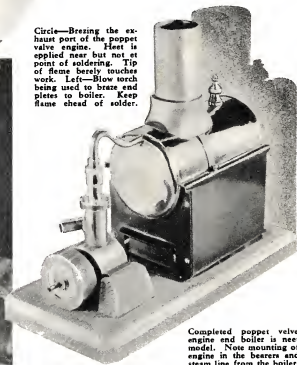
Now we can take up a practical application of brazing by constructing the boiler for the model engines. The design shown here is simple to construct. It is tested to 150 pounds pressure. The four fire tubes serve to get steam up quickly and is designed to provide enough power for either of the two models that appeared in this magazine last month.

A handy list of the principal materials required in making this little boiler is appended to the construction drawings. Study it and have all the necessary metals on hand before starting to build.

Take a piece of 20-gauge hard drawn
[Continued on page 128]



Circle—Brazing the exhaust port of the poppet valve engine. Heat is applied near but not at point of soldering. Tip of flame barely touches work. Left—Blow torch being used to braze end plates to boiler. Keep flame ahead of solder.



Completed poppet valve engine and boiler is next model. Note mounting of engine in the bearers and steam line from the boiler.

Nickel Plating Without Electricity

WHILE the usual nickel plating process is somewhat complicated and requires special equipment it is possible to do fair plating work without the use of heat or electricity. Corroded water faucets, worn automobile handles and similar articles may be plated by simply dipping into the plating solution and polishing on a buffing wheel.

It is necessary to first strip the old finish from the surface of the metal by scrubbing with dilute hydrochloric acid. Smooth down any rough places with emery cloth and grind off any pits caused by corrosion. Next, clip narrow strips of zinc to each article at several places so as to produce the necessary chemical reaction.

Now the article to be plated is dipped in a coppering solution until it takes on a red color. This is to make the nickel adhere to the metal. The copper solution consists of 1 ounce copper sulphate dissolved in 32 ounces water. Add sulphuric acid by the drop until the blue liquid clears.

After removing from the copper solution the articles are placed in the nickel bath. This consists of the following ingredients:

Water	32 oz.
Ammonium Chloride	180 grains
Cream of Tartar	350 grains
Sodium Chloride	90 grains
Tin Chloride	330 grains
Nickel Sulphate, single	530 grains
Nickel Sulphate, double	2 oz.

While in the nickel bath the articles should be kept in motion and inspected frequently as it requires only a few minutes for a durable plating to be applied. By attaching each article to a cord the process is greatly simplified and much disagreeable work eliminated.

After a satisfactory nickel plating has been deposited on the metal it may be removed from the bath and polished. The polishing can be done with a cloth if the article is small or a buffing wheel or fine wire scratch wheel if available.

It should be borne in mind that this method of plating is inferior to the usual electroplating process as its lasting qualities are limited depending upon exposure to elements and the thickness of plating.

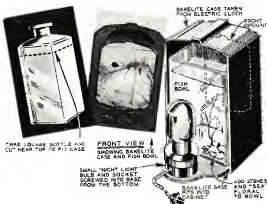


Wrap narrow strips of zinc around the article to be plated as shown directly above. The articles are suspended to a cord then submerged in the plating solution for several minutes. Polish with wire buffer, as shown.

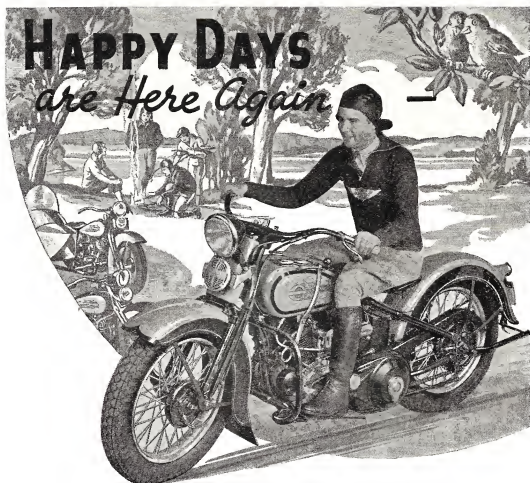
Illuminated Fish Bowl

A VERY novel fish bowl that is certain to command the attention of visitors can be made from an electric clock case, a square shaped bottle and a "night light," the latter being purchased in the 10 cent store. The miniature illuminated aquarium will make a most unusual decoration for a living room table or top of the radio.

Cut a plywood or bakelite base to fit the bottom of the case mounting the "night light" on it with machine screws. Cut off the bottle near the top so that it will slide into the case freely. Fill the jar with water and place in it "sea floral" and several fish. The weight of the bowl holds the light base in its proper position.



This miniature fish bowl forms an action under-sea picture. Colored stones, sand and sea floral along with several small tropical fish produce illuminated third dimension scenes.



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☐ 31 years and up, ☐ under 16 years. Check your age group.

M.M. Memory Testers



How good is your memory? Can you answer correctly the questions appearing below? The correct solutions to all will be found somewhere in the March issue. After you have made your choice fill in the coupon printed below and mail it to Modern Mechanix Publishing Co., Greenwich, Conn. The editors would like to see your results. It is not necessary that you sign your name. Keep one coupon to check answers which will be published in the May issue of MODERN MECHANIX. Try the questionnaire on your friends and send their results with yours.

- The city of — Paris (a), Chicago (b), London (c), New York (d), Fairbanks (e) is often called "The Aerial Hub of the World".
- To insure proper filming, Hollywood producers construct all movie scenes in — miniature (a), actual size (b), half size (c) before doing any actual photographing.
- Kites were used by the ancient Chinese armies for — signaling (a), discovering electricity (b), building bridges (c), recreation (d).
- Glider pilots use the variometer—to measure speed (a), air currents (b), altitude (c).
- New York's rural highways are being paved — with cotton (a), salt (b), sulphur (c), sugar (d).
- The longest railroad bridge in the world spans — the St. Lawrence river (a), Delaware (b), Schuylkill (c), Ohio (d), Mississippi (e).
- Clyde Pangborn expects to make a non-stop flight — from the North Pole to the South Pole (a), non-stop flight around the World (b), Los Angeles to Tokyo (c).
- The diesel engine is — a recent invention (a), an invention 40-years old (b), 25-years old (c), 10-years old (d).
- The Wheatstone bridge is — an electrical instrument (a), a famous bridge in Denmark (b), a machine used in grain mills (c).
- The greatest waterways venture ever undertaken in the United States is — the All-American Canal (a), Panama Canal (b), Trans-Florida Canal (c).
- England is planning to inaugurate trans-Atlantic air service — with an autogyro (a), helicopter (b), dirigible (c), composite flying boats (d).
- A newspaper that talks instead of having to be read — is the dream of most inventors (a), an invention already in use (b), a silly impossible idea (c).
- Steam coming from tea kettles, etc., is produced for motion pictures by — steam pressure boilers (a), white powder (b), dry ice (c).
- Synthetic diamonds are formed — from carbon and iron (a), sand (b), cobalt and zinc (c).
- A sugar that is twice as sweet as the cane or beet product was recently refined from — sweet potato plants (a), dahlia roots (b), corn stalks (c).
- Houses constructed of glass are — impractical (a), a practicable reality (b).
- Kelp is — a new chemical (a), a sea weed (b), a fruit (c).
- An invention is not protected — until registered in the U. S. Patent Office (a), unless a sworn witnessed statement proves date of conception (b), until copyrighted (c).
- Glider pilots keep their ships up by — flapping the wings (a), turning a hand powered propellor (b), by picking rising currents (c), by doing a loop (d).
- Neutronic rays — will illuminate an object two miles away (a), permit man to see in the dark (b), are more deadly than X-Rays (c).

Check your answers by making a mark on the letter which you think best answers the question listed in columns above.

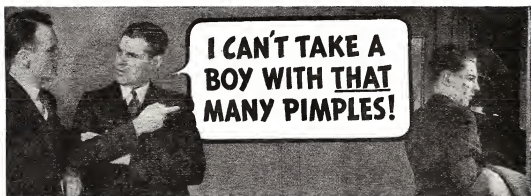
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|-------------------|-----------------|
| 1. a, b, c, d, e. | 11. a, b, c, d. |
| 2. a, b, c. | 12. a, b, c. |
| 3. a, b, c, d. | 13. a, b, c. |
| 4. a, b, c. | 14. a, b, c. |
| 5. a, b, c, d. | 15. a, b, c. |
| 6. a, b, c, d, e. | 16. a, b, c. |
| 7. a, b, c. | 17. a, b, c. |
| 8. a, b, c, d. | 18. a, b, c. |
| 9. a, b, c. | 19. a, b, c, d. |
| 10. a, b, c. | 20. a, b, c. |

Check this coupon and mail to Modern Mechanix Publishing Co., Greenwich, Conn.

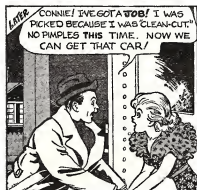
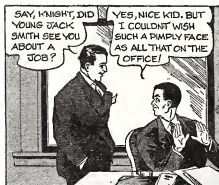
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| 1. a, b, c, d, e. | 11. a, b, c, d. |
| 2. a, b, c. | 12. a, b, c. |
| 3. a, b, c, d. | 13. a, b, c. |
| 4. a, b, c. | 14. a, b, c. |
| 5. a, b, c, d. | 15. a, b, c. |
| 6. a, b, c, d, e. | 16. a, b, c. |
| 7. a, b, c. | 17. a, b, c. |
| 8. a, b, c, d. | 18. a, b, c. |
| 9. a, b, c. | 19. a, b, c, d. |
| 10. a, b, c. | 20. a, b, c. |

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Address



... But Jack gets a tip— AND a JOB!



Don't let Adolescent Pimples make YOU lose out

After the beginning of adolescence—from about 13 to 25, or even longer—important glands develop and final growth takes place. This causes disturbances throughout the body. The skin gets oversensitive. Waste poisons in the blood irritate this sen-

sitive skin. Pimples appear. Fleischmann's Yeast helps to correct adolescent pimples. It clears these skin irritants out of the blood. Then, pimples go! Eat 3 cakes a day, before meals—plain, or in a little water—until your skin is clear.



—clears the skin
by clearing skin irritants out of the blood

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FROZEN INK at Little America angers philatelists. icy cancelling machine gears and numbed fingers are just a few other reasons why letters mailed to collectors from the Byrd expedition are not as neat as they might be. In addition, Sailor Clark, assigned to cancel 54,000 letters, used wrong date. Many collectors, who paid \$32

STAMP ODDITIES

for each cover, are protesting.

GUMLESS STAMPS that stick when moistened bewildered Belgians recently. The secret is invention of an adhesive paper which needs no gum.

ERRORS in stamps are still be-

ing made by U. S. A number of 1½¢ stamped envelopes, printed in red, color of 3¢ envelopes, were bought at several postoffices by alert collectors.

ELECTRIC EYE helps print U. S. stamps. Photocells now control ma-

chines perforating the regular two-cent stamp, to give accurate location of perforating holes between stamps. If the method proves successful, it will undoubtedly be applied to making off-center copies real rarities. Dashes in the margins of sheets alongside plate number must be under photo-cell before perforating begins.

ADLETS FOR HOBBYISTS

(See regular classified section for rates and other information.)

STAMPS

BURIED AND FORGOTTEN for almost 50 years in some abandoned imperial government building in Istanbul were hidden veritable treasures. The cream of Turkey 19th Century stamps have just been accidentally discovered there. Nothing as sensational has happened in many years. Extremely scarce for over 30 years, 19th Century Turkey are missing everywhere. To increase our mailing list we offer 10 of these sensations, cataloguing \$1.00 for the bargain price of only 10¢ to approval applicants. Premium hounds disregarded. Globus Stamp Company, 268—4th Ave., Dept. 150, New York, N. Y.

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Two-Millionths of an Inch—

1400 TIMES "THINNER" THAN THIS SHEET

TWO-MILLIONTHS of an inch is approximately one fourteen-hundredth as thick as the paper on which this message is printed. This will give you some idea of the remarkable accuracy of Johansson Gage Blocks—the world's standard of measurement. For these blocks, in the "AA" quality, are not permitted to vary from specified sizes by more than two-millionths of an inch.

The flattest surfaces ever produced by man are the surfaces of these gage blocks. When the blocks are wiped clean and slid one against the other with slight pressure, they cling together so tightly that the force required to pull them apart often exceeds two hundred pounds.

Carl Edvard Johansson produced the first set of blocks at Eskilstuna,



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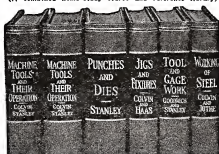
[Continued from page 78]

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insulator or other part may be damaged by a lightning discharge, or by a discharge of the power current itself, which may be set off by a lightning flash that produces a path for the power surge. Power frequency tests can be made up to 2,000,000 volts potential, with the equipment at Barberton.

This equipment includes a trio of futuristic-looking transformers, mounted on bases made of special glazed porcelain tile manufactured in the company's own kilns. The transformers are connected in cascade, that is, one feeds into the next, ending with the final one which discharges through the equipment being tested. The first or lowest voltage transformer is situated inside the laboratory, in a well whose sides slope outward at the top to keep them out of reach of the electrical field. The remaining two transformers stand outside, in the laboratory yard. The height at which they are placed above the ground is a rough indication of the voltages they are required to handle. The final one towers almost 50 feet.

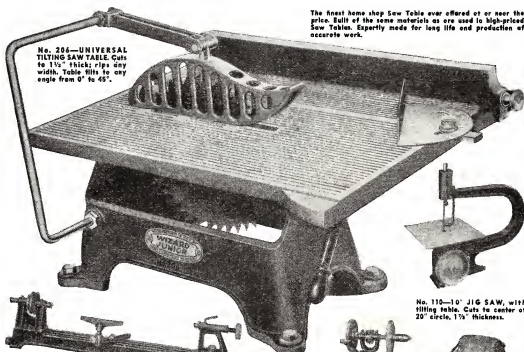
Operator Views Electrical Bombardment

A feature of the power-frequency testing set-up is a novel remote-control desk that can be moved about, so that the operator always has a good view of the insulator being bombarded. This panel was designed by engineers of the laboratory staff. It looks somewhat like the control panel of a radio station, except that the visible equipment is not extensive. There is a lever that the operator moves to set the transformers in action. A red lamp glows when this is at the "on" position. After he moves the lever, everything else progresses automatically. A rotary switch on one wall of the laboratory moves around slowly, controlling the gradual building up of voltage. When the discharge takes place this switch reverses; the red lamp on the control panel goes out and a green one flashes on. The cable running from the remote control desk to the main switchboard contains as many wires as the typical telephone cable.

High-frequency Generator Has 750,000-volt Output

A third division of the electrical laboratory contains the high-frequency generator. This machine, which is basically a giant Tesla coil, has an output of 750,000 volts, at frequencies up to 80,000 cycles. That is, the current leaps back and forth, from positive to negative, 80,000 times per second. This equipment is used for special high-frequency testing, such as the subjecting of radio insulators to conditions approximating those they will encounter in normal service.

[Continued on page 140]



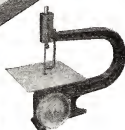
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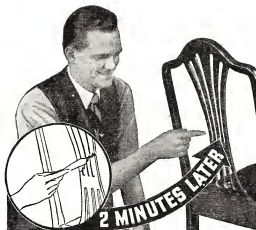
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YOUR PASSPORT TO FISHING PARADISE

Combination Desk and Vanity

[Continued from page 99]

run over on the surface away from the weaving. To prevent this, use a paper paint shield to cover outside wood areas. Before assembling the bench top to leg frame, notch side and end rails to take the under seat weaving, as shown in Fig. 12. Then sand with fine sandpaper preparatory to finishing.

If the construction is of hard maple or birch, the surface is stained with golden oak stain, which is quickly rubbed off leaving a mellow brown tone. Follow with two coats of rubbed wax. If made of walnut, finish by first applying a liberal coat of linseed oil, and let stand one hour, then wipe dry with a clean cloth. Sand the surface lightly and apply a coat of filler, wiping off any excess. When dry, rub to a smooth finish with fine sandpaper and apply a coat of white shellac. Rub this down with fine steel wool, followed with two coats of rubbed wax.

When this set is used as a vanity, to complete the picture of Colonial authenticity, it should be used with a hanging mirror of Chippendale design.

Freight Train for Model Railroad

[Continued from page 109]

The sides are then glued in place and you have a box car without the finishing details, the little fittings, the walkways, hatches and brake wheels which go so far to make these little cars so realistic. If ten-ply cardboard is used on the sides the desired width of 1½" will be obtained automatically. The roof top can be the wood former itself or it can be covered completely with thin cardboard overhanging the ends and sides about ¼" to produce the eaves. The walkways are simply pieces of cardboard, ⅝" wide and cut so they project ⅛" beyond each car end. Scribe them as shown in Fig. 13 to imitate planking and glue to the roof crown on top of small cardboard spacers which are laid at half inch intervals along the roof. The roof ribs are thin strips of cardboard glued to the roof pitch at intervals as shown in Fig. 1.

Ladders and grab irons are best made out of light gauge copper wire cut and bent properly and pressed into holes previously made in the car side with a needle. A dummy brake wheel adds to the effect. The ice hatches, side walkways and corner trim of the roof are shown in Fig. 13.

In the case of the stock car the open side effect may be obtained by scribing and painting with black paint.

The flat car, as shown in Fig. 14, is the easiest to make. It is covered in detail in Fig. 14.

The hopper car illustrated in half side ele-

[Continued on page 135]

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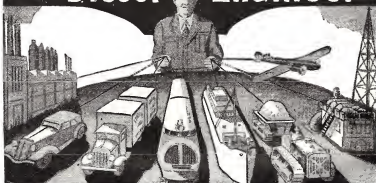
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Instrument Have You Instrument?

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Just as the gasoline engine changed or wiped out the jobs of thousands who depended on horse-drawn vehicles for their living—just as electricity changed the entire set-up in the fields of light and power—so now the Diesel engine is fast invading both the power and transportation fields, and threatening the present jobs of thousands of workers.

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Please send me your Free Book, "How to Obtain a Patent,"
and "Record of Invention" form.

NAME

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What Inventions Does World Need?

[Continued from page 69]

mechanic to enter this contest. All you need is the idea. You do not have to solve the problem. Leave that up to the inventor. Here are a number of ways you might have picked up winning ideas, based on the illustrations.

The hunter takes his gun down from a wall rack and wonders if it is loaded. This leads to the thought that a gun should have some kind of indicator to show that it is loaded. The inventor who could devise such an indicator could probably sell the device.

When you pick up a new package of cigarettes, haven't you often wished for a simpler way of opening them besides picking at the wrapper with your fingers? That little problem passed on to an inventor might be solved easily.

Inventions Needed for Office and Home

Clerks must now be employed to stuff envelopes with advertising literature in mail order and direct mail advertising offices. How much simpler and cheaper it would be to devise a machine to do the work?

On the other page there are illustrated more ideas that might have been submitted in this contest. Firing the furnace and sifting ashes are troublesome home tasks that should be eased by some ingenious inventor.

Many kitchen tasks are done at the sink. How much simpler it would be if the housewife could be seated while handling these tasks? The problem could be solved by inventing a sink that could be lowered and raised by means of a handle so that it would accommodate people of various heights.

The leather tips and high heels of women's shoes are constantly coming off. The inventor who can find a means to prevent either from coming off the shoe should be able to sell his invention at a good price.

Electricians splice wires by hand. It is a slow job that could be speeded up with a simple tool that would do the splicing quickly, neatly, and tightly.

These are the type of ideas that will win prizes in the monthly Needed Inventions contest.

HELP FOR INVENTORS

The Editors of MODERN MECHANIX AND INVENTIONS MAGAZINE are always ready to assist inventors with their problems to the best of their ability. Since thousands of letters are received from readers each month, the editors can not devote the time to make a thorough explanation or to do extensive research in reply to each letter. For more complete information on any problem of inventions or patents, we suggest that inventors write to the various firms advertising in this magazine that specialize in your particular problem.



INVENTIONS WANTED

Turn patented or unpatented ideas into cash with this new book. **Inventors' Selling Guide**, by Raymond F. Yates, who has helped over 30,000 inventors. Nothing else like it—gives classified list of nearly 1000 manufacturers who buy ideas, tells how to protect ideas without patents, how to sell chain stores, price inventions, etc. Covers Proved Methods of Selling, Finding Buyers, Royalty Contracts, "Rachos" to Avoid, Selling Patents Pending, Financing, Selling Unpatented Inventions, many other vital topics. Cloth bound book, 224 pages, postpaid \$2 (or C.O.D., \$2.12). Satisfaction guaranteed.

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INVENTORS and MECHANICAL MINDED MEN

Can You Answer these Questions?

For the answers to these questions and other information of value to you, look on page 18.

1. What is the only effective way to protect an invention?
2. What is first step in making application for patent?
3. How many patents were issued to Thomas A. Edison?
4. To what president was issued patent for expanding air-chambers to lift river boats over sand bars?
5. How many years does a mechanical patent remain in force?
6. How does the issuance of a patent protect the inventor?
7. Is it compulsory to prepare a working model before making application for patent?
8. What is a "Record of Invention" form?
9. Why does the Patent Office advise applicants to employ registered patent attorneys?
10. When can an article be marked "Patent Applied For"?

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Down Hills With Soap Box Derby

[Continued from page 85]

the front wheels is detrimental to the speed, while any tendency of the brakes to drag is equally bad. Yet the steering cannot be too tight, nor the brakes too loose.

The prizes offered are on as large a scale as the derby itself. Winners in the local contests are showered with valuable gifts from their sponsors and from the local merchants. The winner from each city is then sent to the National Finals at Akron where he will contend for a first prize of a 4-year scholarship at any recognized college or university, a gold medal, the National Trophy with a diamond setting, and a factory built midget racer. The second place winner is awarded a Chevrolet Master coach, cups and medals, and the third place winner receives a Chevrolet Standard coach and appropriate emblems and medals. Then there is the Charles F. Kettering Trophy for the best built car; the Indianapolis Motor Speedway Trophy for the car with the fastest single lap; the Collins and Aikman Trophy for the best upholstered car; the J. D. Tew Trophy for the best designed brakes; the Climacene Trophy for the best designed car, and the Brunswick prize for the winner of every heat.

The Soap Box Derby fills a long-felt void by calling upon youth to tax its natural talents for speed and ingenuity.

Lures That Will Catch Spring Trout

[Continued from page 83]

together with a silk-like fluid that the larva spins. As the larva grows it either abandons its case and builds a new and larger one or adds onto the front of the old one.

The stone flies when in a nymph form are extremely active and are found under the stones and debris of a stream. Unlike the May fly nymph, which is vegetable-feeding, the stone fly nymph is carnivorous, feeding on the young May flies and other like life. They are sought out eagerly by the trout in the early spring, and because of this fact, artificial imitations in the shape of nymph flies are the most deadly lures one can use before the winged insects are in the air.

The late Louis Rhead, one of the foremost angling writers of the country was the first to introduce the use of the nymph fly in artificial counterpart to the anglers of the country. These artificial flies are tied very much like the nymph, being wingless and with hackle legs on the sides. A very killing color I have found is a gray belly with a brown back. To some extent I would say that the color is not so much to be preserved as the shape of the nymph with its hackle legs.

[Continued on page 138]

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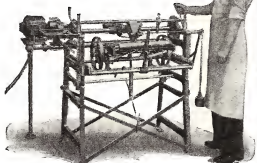
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Learn Brazing On Model Engines

[Continued from page 113]

seamless brass tube 4" long and 2½" diameter. Face off the ends or lightly file them square and mark out the holes for the fire tubes. These are then center punched and progressively drilled with ¼" and ⅜" drills. Bore squarely into the shell and when all the holes have been drilled put the drill on medium speed and lower the table. We are now about to perform a rather unorthodox operation, at least not common to machine shop practice, but well known among model boiler makers. This calls for some caution as the shell is liable to jump out of your hands and start spinning with the drill.

Drilling Elliptical Holes

The idea is to start the drill through the hole in the same way it was originally drilled but gradually tipping the boiler at such an angle that eventually the drill will enter its proper corresponding hole on the other side of the boiler shell. Carefully done this will result in nice elliptical holes so that the ⅜" O. D. 22-gauge seamless brass fire tubes can be punched through at the correct angles.

Cut the tubes off about ⅛" over length and drill a hole for the safety valve. Polish joints with emery, flux well and, using a blow torch, braze the inside fillets first.

Next come the ends. These are cut to 2⅞" diameter by scribing, sawing and finishing to outline with a file. The flanges are obtained by peening or hammering the outer circumference of the discs down against a mandrel of slightly smaller diameter than the inside diameter of the boiler into which the flanged ends are required to fit. A small slot is cut in one end piece to accommodate the steam pipe which is brazed in. This steam pipe is ⅜" O. D. copper tubing, cut down as shown to deflect water from the tube. The flanges are now cleaned up and pressed into the boiler ends. Use a torch to braze the ends.

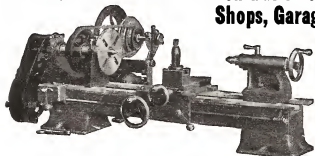
Pickling Boiler in Acid

After completing the brazing the boiler is put to pickle in a dilute solution of copper to which a few drops of sulphuric acid have been added. After about half an hour the brazing oxides will have been pickled off and the boiler will take a nice shine. This treatment is recommended for the engine parts described in the last article, but all bearing holes as well as the cylinder holes should be plugged with paraffin before dipping.

The safety valve is a simple device consisting merely of a small ⅛" rod with a 45-degree tapered end that sits against a 45-degree countersink in a ⅜" hole drilled through the brass turning which forms the valve chest. The valve is held in place by a small length

[Continued on page 152]

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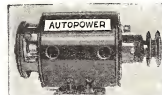
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Making a Paradise

[Continued from page 65]

made one or more pups at an hourly rate, are scattered all over town.

Parking the dog for an hour, an afternoon or a day can be accomplished easily in a score of places. The most recent innovation is the "Puppy Club" established on the roof of a Park Avenue hotel. Presided over by a trained attendant as well as a veterinarian, this sky-high "parking ground" is decorated with gay umbrellas and beach chairs and equipped with individual "cabanas" for His Majesty the Dog!

Dogs Get Ambulance Service

Last winter a local veterinarian created quite a stir in dog circles by announcing the installation of an ambulance service. The ambulance is complete with bell and siren.

No discussion of services offered to dogs would be complete without some mention of the variety of clothing, harness, luggage, toilet accessories and other equipment available to dog lovers in a big city like New York. You will find a canine replica for virtually every furnishing known to man, from a four-poster Colonial "bed" to cosmetic kits and toothbrushes.

Imagine the old-fashioned canine wearing eye-glasses! And yet one of the largest sporting goods stores, which has a special dog shop, sells them for dogs to wear while motoring.

Rubber Booties Keep Fido's Feet Dry

This same store has many "best sellers," among them dog couches and beds made of walnut and mahogany, equipped with Kapok-filled mattresses and attractively covered with cretonne. Other articles include dog kennels made of white pine, with green waterproof asphalt roofing; shipping crates with brass fittings and a galvanized drinking cup; special eating dishes for Spaniels designed to keep this breed's long ears out of the food; oilskin raincoats for inclement weather; tiny rubber and chamois "booties" to match the raincoats; "silent" dog whistles which can be pitched to be practically inaudible to anyone but the dog, and a leather tail guard for Great Danes to wear about the house to keep the tail from being bruised.

Novelties include chocolate scented balls and bones, made of rubber; a "sani bone," which is a real bone chemically treated to avoid chipping and splintering; a cosmetic kit complete with hair tonic, talcum powder, boric solution for the eyes and brilliantine for the coat; a "porto pen" to keep the wandering pet at home and a variety of playthings, all modeled after real children's toys.

Yes, it's a dog's life, all right, and oh, what a happy one!

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You Drive a Million Dollar Auto

[Continued from page 39]

assurance against wavy or broken highlights. A plaster cast is then taken of the wood dummy—the same process used by sculptors in casting bronzes. The dummy is, on a huge scale, a pattern such as is used in a foundry.

Divided into sections suited to the size of gigantic stamping presses, the plaster cast becomes a mold from which a steel casting is made. From this casting dies are shaped which will transform a flat piece of steel under tremendous pressure into a hood, a fender, or a unit of the body.

The chassis and motor of the car have been undergoing refinements while the body is being designed.

Formulas Play Part in Design

From the engineer's point of view, an automobile is the most alluring subject for involved mathematical computations imaginable. When you buy a car you get, among other things, such mysterious figures as this:

$$S = \frac{16 Pr}{\pi d^3} \left[\frac{(4c-1)}{(4c-4)} + \frac{.615}{c} \right]$$

This cabalistic formula, incomprehensible to the layman, is but one of thousands which the knights of the slide rule had to make before your car could even begin to be manufactured. It represents the maximum stress allowable in a coiled spring of the type used in knee-action mechanisms.

The work of the artist, vital though it is, must always remain subject to the engineer's final approval. For an artistic car, even an efficient car, falls short of satisfying the demands of today's driver. It must be safe.

How Blind Spots Are Found

Watch how the designers conduct their unremitting search for safety. A car is wheeled into a darkened room in General Motors testing laboratories. It is being given a visibility test. In front of it is a curved white wall, marked off into thousands of inch-square divisions. Behind the car powerful lights are turned on, beating through the car windows and projecting shadows on the curved wall.

A draftsman makes a copy of the area of visibility marked on the one-inch squares. Engineers pore over the chart, figuring methods of reducing the darkened areas and removing blind spots.

Important to safety, too, is the location of a car's center of gravity. If it is too high, the car rolls over easily. If too far to the rear, trouble develops in making turns at high speeds; if too far forward, steering is difficult. How can a car's center of gravity be determined?

[Continued on page 135]

HOW TO GET THE BEST RESULTS with Your Harmonica

The harmonica is such a popular and widely used instrument that we are anxious that all boys and girls should understand its full possibilities so as to get the best musical results. To do this a selection of the proper type of harmonica is desirable.

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Dept. AE-207 Chattanooga, Tenn.

Freight Train for Model Railroad

[Continued from page 122]

vation, Fig. 5, is a quadruple hopper of the Lehigh Valley type and presents no unusual trouble to construct. The frame, as already noted, dispenses with the web or side plates and wooden dummy chutes are glued to the bottom at the proper positions.

The side members of the hopper car are cut out as shown in Fig. 13 to provide corner posts and ladder plates. The side gusset plates are glued in place.

The gondola car is of similar construction but the chassis retains the web pieces.

The caboose is covered in Figs. 9 to 11. The general form of construction prevails. This car is not modeled after any particular railroad.

The sides are not carried down to the lower edge of the car floor but terminate $\frac{1}{8}$ " or halfway down, from the bottom of the floor.

After the ends are in the main roof former is glued in place in the usual manner and the sides attached. The cardboard roof is in two pieces, each extending from the cupola to the ladder.

Usually box cars, gondolas, and cabooses are finished in maroon color. Refrigerator cars are often white with black trim and maroon roof. Use a flat paint and cover with clear flat varnish. Japan or coach colors are especially suitable for model work.

You Drive a Million Dollar Auto

[Continued from page 133]

Three hundred years ago Galileo sat in the Cathedral at Pisa, Italy, observed a chandelier swinging before the altar, and formulated the law of the pendulum. Engineers now apply it to make sure that the modern motor car will hug the road and control easily.

Standing in the laboratory is a device which looks like a huge playground swing, suspended from a crossbar. A car is driven in and fastened in the swing. An engineer gives the swing a push and we see that it is in reality a huge pendulum. The time required to make a complete oscillation is recorded. It is then a simple matter to apply Galileo's law to compute the distance of the pendulum pivot from the center of gravity of the car, and by deducting the height of the swing obtain the position of the center of gravity relative to the road.

There is an added thrill in the ownership of a new motor car when the driver realizes that he is also part owner of pencil sketches which cost far more than a Rembrandt, and of clay and plaster models costlier than the Venus de Milo. He is literally the owner of a million-dollar car which no millionaire could improve.

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Behind Scenes With March of Time

[Continued from page 62]

wares to one of the body guards while an automatic camera, concealed among the oranges, took the first close-up motion pictures ever made of the "mystery man of Europe."

The preparation of a story for a March of Time sequence is assigned to one or more script writers. The script may be rewritten from twenty to 150 times before it is approved by the editors. Once it is approved, conferences are held to determine what camera shots will be needed. Some of the scenes needed already are on file in the laboratories or can be obtained from film libraries. Others must be re-enacted because no camera record exists. These may be made with the actual persons, involved in the story, performing as amateur actors. If necessary doubles of these persons are called upon to re-enact the scene and supply the necessary realism.

Prominent Men Enact Scenes

These re-enactments are probably the most difficult part of the entire work and call for a great amount of ingenuity.

Sometime ago, in an issue which described the career of the late Huey P. Long, the senator himself posed for bits of the episode in his Washington office. In another issue, which was devoted to the retirement of Giulio Gatti-Casazza, general director of New York's Metropolitan opera house, the famous Italian allowed a cameraman, dressed in top hat and evening clothes, to shoot scenes of himself backstage at the opera house. Chief Justice Charles Evans Hughes of the Supreme Court is another important personality who has permitted himself to be photographed for a sequence describing life in Washington.

Editors Must Forsee Events

The March of Time has on file the names and photographs of hundreds of actors, who can be called upon to appear in the scenes that must be re-enacted. There also is a list of actors who can impersonate the voices and actions of important characters. These sometimes are called upon for only a few feet of film necessary to complete a story.

Because the professional news cameraman can not always be at the scene when a story breaks, the editors of the March of Time are willing to correspond with amateurs who may have been fortunate enough to be present or who have unusual scenes which might prove of importance in the filming of future issues.

Sometimes the editors must look forward to events that are expected to occur. The scenes must then be pre-enacted. This was the case in a sequence that depicted the inauguration of the trans-Pacific Clipper air service by Pan American Airways. The

[Continued on page 152]

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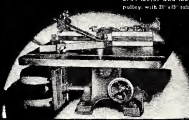
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Lures That Will Catch Spring Trout

[Continued from page 126]

Stone fly nymphs run to an inch and a little more in length, therefore they are quite a sizeable creation. The hook to which they are tied should preferably be to No. 8 or 10, the former, being larger, much preferred on streams and rivers where trout are likely to run large. In streams that are small one should follow suit with smaller nymph flies. The artificial imitation or counterpart of the live nymph should be played deep or fairly so.

In successful practice it will be found that a nine-foot tapered leader is the best to use, the same graduating down to a 3x point to which the fly is attached. A tapered leader of the sort is easily handled, the limp point or fore-part of the leader permitting the lure much action where a stiffer leader would allow it no play at all.

No Split Shot Needed With Nymphs

Only one nymph lure is used on the leader. No split shot are lodged on the leader to sink the lure down to the bottom after the manner of the "shotted" fly. The nymph must, so far as possible, sink of its own accord.

The writer's favorite method of playing a stone fly nymph is to locate a boulder or some likely place directly below the point where the cast is made. The line is cast upstream and across, the progress of the line and lure being followed by the rod-tip. The lure is permitted to swing into place after which it is moved up an inch or two, and permitted to fall back. Thus by twitches and jerks the lure is worked in the water. This sets the hackle legs of the nymph to life, putting sufficient animation into the lure to completely deceive the trout.

Bucktail Flies Get Their Trout

Aside from the regulation nymph flies it should not be lost track of that small squirrel-hair and bucktail or buckhair flies are exceptionally taking during the course of the early spring fishing season. Indeed I would go so far as to say that in western streams, the small inch-long buckhair flies are the best of the lot and will take more trout, if skillfully played in the water than worms or even live minnows.

Other lures excellent for spring fishing are buckhair mice of the baby size, hardly more than an inch in length. It is to be preferred that these be cast and played around boulders, logs, etc., particularly up along the shores of a stream.

There are times in the spring when the water is more or less dingy, even roiled, when the angler is in despair. At such times a lure with a twinkling spinner at its tail, or flies with little spinners at their head, give enough twinkle and flash to a lure to attract the attention of trout in a murky environment.

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Science Stalks Power Enemy No. 1

[Continued from page 120]

The electrical wonderland at Barberton, is being used daily for the purpose of working out better ways of protecting power line equipment from criminal lightning and of reducing thunderstorm interruptions in service. Eventual fruit of such work may include reduction of consumer power rates.

Fortunately, it is not necessary to generate artificial lightning on the same scale that Nature does, in order to study its criminal activities. When a lightning discharge strikes a power line, only a fraction of it affects the equipment directly. Also, the present limit on power line voltages make it unnecessary to use research voltages beyond a certain point, in studying power surges and the like. What the engineers do when they want to study the actions of natural lightning, is to manufacture only that fraction of it which affects equipment directly. At present, that fraction seldom exceeds 3,000,000 volts. The highest voltage to be used for power transmission in the near future will be 287,000, on the Boulder Dam line.

Every insulator that leaves the company's plant is tested at voltages and under conditions more severe than any it is likely to experience in use. Most of the routine testing is done in factory laboratories, leaving the main electrical laboratory free for original research and testing of special equipment.

Battle Tactics of Flying Fleets

[Continued from page 50]

used for the approach the planes would be so scattered that they would be in communication with each other only by radio.

If we assume that a major aerial offensive is to be launched against a concentrated industrial district which is the backbone of the enemy's war industries, we have the illustration of mass attack against a typical area target. In this case the attack will probably take the form of a straight, frontal offensive.

If the area covers, let us say, five square miles, the raid would be planned carefully in advance. Every factory and every detail on the landscape within the area would be studied. The area would be platted off and each plat assigned to certain planes. Planes carrying 600-pound bombs would be detailed to sections studded with small industrial plants capable of being demolished with such light bombs. Planes with more powerful bombs would be assigned to larger factories.

The flying fleet's approach to such an area would be made at the highest possible altitude, 18,000 feet up or more. Upon reaching the area, the fleet would break from the approach formation and deploy for attack. Noth-

[Continued on page 145]

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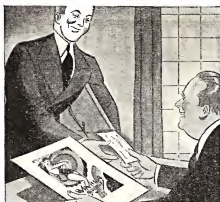
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[Continued from page 55]

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123 Win \$1750.00 in Photo Contest

[Continued from page 55]

best slogans to a vote of thirty disinterested persons, who had not seen the entries and did not know the names of the contestants. Mr. Damush's slogan, "The Monthly Review of Human Ingenuity," was given twice as many votes as that of Mr. Beecher.

Mr. Beecher's entry was judged correct in all respects and his slogan, "A World of Ideas—Ideas for a World," was the deciding factor in the award of second prize of \$300.00.

Hundreds of contestants were eliminated for failing to identify one or more of the scrambled photos. Others were disqualified for failing to spell the names of persons in the photographs correctly; long slogans; more than 25 words in each description; failure to answer questions; failure to include name.

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Battle Tactics of Flying Fleets

[Continued from page 140]

ing gums up anti-aircraft gunnery more than sudden changes of altitude, especially if the attack can be launched from behind a screening layer of clouds. Hence, from a point near the edge of the target the planes would come diving down, level off at perhaps 10,000 feet . . . and let go their bombs. They would blanket the target with a deluge of bombs, fire and chemicals and zoom back into clouds.

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Serious questions recently arose centering about the vulnerability of troops on the march to aerial attack with machine gun fire, fragmentation bombs and mustard. For the purposes of a test the gunfire and bombing had to be theoretical. The gas test, however, proved the effectiveness of mustard. For the test the soldiers were dressed in white duck suits and sent marching over a highway to be raided by an air force. Flying low the planes let down showers of water stained with a bright red pigment. In spite of the fact that the soldiers dived for any available cover at the first theoretical burst of machine gun fire and bombs, every last man came out of the "raid" with miscellaneous streaks and spots of red on his white garments. Some of them looked like flamingoes. Had the tinted water been mustard gas every man receiving a dash of it could have been marked down as a serious casualty.

The devastating possibilities of aviation for killing or crippling wars at their sources without ever wasting a bomb on battleships or civil populations are now known and understood by every major world power. There is apparently no answer to the problems of defense against a military weapon that can strike out of clouds, fog and darkness at a thousand and one vulnerable objectives and with no possible way of knowing when or where the enemy is going to strike. The threat of war in the air is so serious to the U. S. that if this country ever suffers a major air raid, our only defense would be to seize the offensive and go after the enemy on his own home soil.



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Learn Brazing On Model Engines

[Continued from page 128]

of brass spring. A spring load of five or six ounces will permit a working pressure of some thirty pounds.

The boiler proper being completed we can proceed with the firebox. This is cut out of black iron as the drawings depict. The shell is lagged inside with sheet asbestos moistened after cutting to shape.

The lamp box construction is covered in the drawings.

A plumber's nickel-plated sink drain fitting is turned upside down, peened to form an elliptical bell and filed down to form a saddle over the boiler so that it covers the otherwise exposed fire tubes. Small iron straps are riveted to the fittings and secured to the fire box as shown with 2-56 screws and nuts.

A piece of tin, about 22-gauge, is cut out as shown to insulate the lampbox from the wooden base. This base is fully covered in the drawings.

Fill the boiler two-thirds full of water, load the lamp, pull up the safety valve to see if it is free, light the lamp and let the boiler heat up. If it is hooked up to an engine it is a good plan to have the engine well oiled and to twist it once or twice to eliminate any priming water that may have got into it from handling the boiler.

Behind Scenes With March of Time

[Continued from page 136]

filming of this story actually took place several months in advance of the actual date of the flight.

The filming took place in the Caribbean Sea, thousands of miles away from the scene of the takeoff on the Pacific coast, at the time Pan American was testing the Clipper ships that were to be used on the airline. Mr. de Rochemont, his assistant, Tom Orchard, and a crew of cameramen spent three weeks pre-enacting the flight. The company's air base at Miami was transformed into a movie studio.

From blueprints of the landing stations in far-off Pacific islands sets were built on Florida shores. Through the help of the U. S. Hydrographic office an abandoned lighthouse, the exact duplicate of the Spanish type lighthouse in the Philippines, was located. The actors, that were needed to take the place of passengers on the airliners, were recruited from vacationists at the resort.

The illusion of reality in the March of Time, when re-enacted scenes must be combined with real shots, is made possible by the expert supervision of the editors in cutting the negatives. The sound effects, narrator's voice, and music—each on different reels of celluloid—are assembled in the cutting room.



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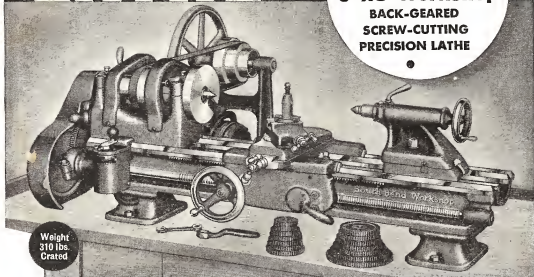
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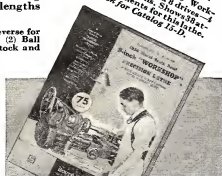
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This new machine to test motor performance analyzes the exhaust gases to determine if the motor is up to standard. An air fuel combustion scales and a vacuum gauge are contained in the unit. Dials give owner a visual demonstration.

A small developing unit produces the absolute maximum of agitation, and enables amateurs to duplicate the best professional results.

A pouring nozzle for liquid containers keeps the container sealed when not in use, and insures a non-dripping flow when liquid is poured.

A continuous printer for making blue prints, brown prints or direct process prints handles work up to 42 inches in width at speeds of from 4 to 60 inches a minute.

A dispenser for salt, pepper, or flour is completely moisture proof. A push rod sifts the salt through, and acts as a seal when not in use.



This new spark plug, at left, throws a flame instead of a spark. It provides instant starting and a 20 per cent saving in gasoline.

A military brush for week end trips contains a complete shaving and hair dressing kit in its back.

A resonance indicator employing an electronic eye tube aids in sharp tuning, checks audio fidelity, aligns stages, and may be used as an output meter.

An automatic cigarette lighter is trouble proof and will not blow out in a wind.



A light screen for camera lenses absorbs polarized light. Reflections on glass, water, or polished surfaces are cut out by the screen, leaving a clear image.

Movie film already threaded in the magazine is the latest development in home movie cameras. The magazine automatically engages with the operating mechanism when it is inserted in the camera. If one wishes to switch to a different type of film, the magazine may be removed without danger of injury to a single frame.

A conveyor which fits any clothes wringer eliminates the danger of crushed fingers. Clothes are fed into the conveyor instead of into the rollers.

A new relay coil for automobiles gives extra power to the ignition system when starting.

A single sheet envelope contains a circular and inquiry blank printed on the inside. When folded in reverse, it becomes a return envelope.

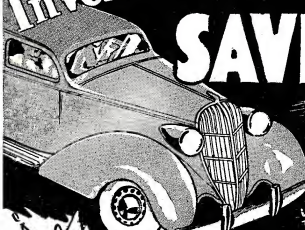


These self-centering screws provide 3 times as much purchase as there is between ordinary driver and slotted screw. In addition there can be no slide-slipping of the driver.

Editor's Note—Addresses of manufacturers of these and other new products in this issue can be obtained by sending a stamped, self-addressed envelope to MODERN MECHANIX AND INVENTIONS, Information Bureau, Fawcett Building, Greenwich, Connecticut. Manufacturers are invited to submit material.

New Invention! WITH SUPERCHARGE PRINCIPLE SAVES GAS

MORE SPEED
MORE POWER
NEW MOTOR LIFE
QUICKER STARTING
UP TO 30% GAS SAVINGS



USERS REPORT

3 TO 7 MILES MORE PER GALLON
MOTORIST SAVES \$180 A YEAR

"On an International truck on a round trip to Cleveland, 360 miles, it saved 10 gallons of gas."—*James Beoley, N. Y.*

"On my V-8 Ford, it works miracles. Its added power, acceleration and top speed has sold me. The results are unbelievable."—*Ralph Fields, Mass.*

"Very glad to say, the Buick showed an increase of 5 miles more per gallon."—*A. V. Groce, Washington.*

"On my Plymouth, I obtained an average of 25 miles per gallon, an increase of 7 miles. This means a saving of \$15 a month or \$180 a year."—*J. E. Fresh, Calif.*

"It saves me one gallon a day. I had to buy 5 gallons each day—now only 4 gallons."—*L. V. Sweet, Pa.*

"My Chevrolet certainly runs smoother, has more power and snap to it since I put the Vacu-Matic on."—*J. H. Nelson, Minn.*

"On my Dodge 8 I am getting 6 more miles per gal., with more power and pickup, which is all anyone could ask."—*Lee D. Berry, Calif.*

"I have twelve Vacu-matic on cars now, and they all show an increase in mileage. The car owners are very well pleased."—*Fred Taylor, Okla.*

"I averaged 25 miles per gallon on a trip with a model A Ford at 40 miles per hour, where before I only averaged 20. Also better pickup and smoother running."—*Wm. Lyons, Calif.*

"I have been placing Vacu-matics on expert mechanics' cars. All are well pleased."—*J. W. Donahue, W. Va.*

VACU-MATIC

the Carburetor Control that "BREATHES"

AT LAST! Automotive engineers have smashed down the barriers to perfected combustion! The new VACU-MATIC solves the secret of greater power! With almost magical action, this amazing invention instantly puts new life and pep in any motor. It adds mileage to every gallon of gasoline... produces split-second pickup, sensitive accelerator response, quicker starting, greater speed and smoother running.

Automatic -- Nothing Like It!

The self-starter—four wheel brakes—knee action—stream-lining... and now VACU-MATIC! The sensational money-saving invention! With it, engineers have achieved a practical means of balancing air and gasoline automatically for all speeds.

Vacu-matic is entirely different! It operates on the super charger principle by automatically adding a charge of extra oxygen, drawn free from the outer air, into the heart of the gas mixture. It is entirely AUTOMATIC and allows the motor to "breathe" at the correct time, opening and closing automatically as required. No idling troubles—no carburetor adjustments necessary. It is so simple it will amaze you—so practical it will save you many dollars on gas costs.

Agents and Salesmen

VACU-MATIC offers a splendid opportunity for unusual sales and profits. Every car, truck, tractor and motorcycle owner a prospect. Valuable territories now being assigned. Check and mail coupon.

Wauwatosa, Wis.

Guaranteed Gas Savings

VACU-MATIC proves itself on every car. It is guaranteed to give worthwhile gas savings, quicker pick-up, and more power or it costs you nothing. You can instantly tell the difference in added power and motor performance — you quickly notice the cash savings on gasoline.

Fits All Cars

VACU-MATIC is constructed of six parts, assembled and fused into one unit, correctly adjusted and sealed at the factory. Nothing to regulate. Any motorist can attach VACU-MATIC in ten minutes. Once in, its only reminder is the surge of instant power and speed it gives to the motor and the savings it affords your pocketbook.

Free Details

You owe it to yourself to know all about this remarkable discovery. Mail the coupon below. Start saving gas with VACU-MATIC and enjoy a new driving thrill! There's no obligation—so get the facts now! Write today!

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Gentlemen: Please send me full particulars concerning the Vacu-matic and details of your Free Offer. This of course does not obligate me in any way.

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